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Address of the President (Mr. Donald McDonald, Louisville, Ky.) of the American Gas Institute, Sixth Annual Meeting, St. Louis, Mo., October, 1911.

Every organism, from the smallest of the microbes to the vastest of the nebulae, seems to follow the general law that, during the early stages of development, changes are rapid and marked. When maturity is reached, changes become less perceptible. The gas business is now about 100 years old, and a single year is too short a time in which to expect that any great changes will be made. Of course, improvements are announced every year, and their inventors are apt to be very sanguine about them; but, until the tests of time and of actual practice are applied to them, no one can say whether or not they are really improvements.

The last year brought a good deal of confirmatory evidence as to the excellence of vertical retorts; but it has, at the same time, brought forward the question as to whether or not chamber or by-product ovens accomplish everything which is claimed for the vertical retorts, besides possessing considerable advantages of their own. The Technical Committee promises up-to-date information on these subjects, and I shall not attempt to anticipate the papers which will be read.

The idea of public control of public utilities has gained considerable ground during the last year, but, at the same time, it seems to to have become much more reasonable. Control by State Commissions is now looked upon by gas men with the hope that the Commissions may be composed of reasonable men of sufficient business experience to understand the problems which confront the business, rather than of politicians who hope to win the favor of the multitude by attempting to require the companies to make bricks without straw. In exchange for public control it seems reasonable to hope that the States will provide such immunity from destructive competition as will compensate for such additional burdens as it imposes. It seems only reasonable that, when the State says to the gas company it can only earn a certain interest on its actual investment, it ought, at the same time, to use its authority as far as possible to take the business out of the category of hazardous enterprises. Competition is by no means the only hazard which besets the business, but it is the one which the State, and the State alone, can remove. Another hazard which the State could greatly mitigate is the continual threat of ruinous verdicts in damage cases. The companies do not ask to be relieved from paying just compensation for any injury that may arise through their negligence or misfortune; but to be continually harassed with claims for imaginary injuries, or to be mulcted for damages out of all proportion to injuries actually received, is certainly a hazard which the investor will have in mind in fixing the price which he will pay for securities, and which the manager can never forget in making up his estimates of what it costs to deliver gas.

I believe, on the whole, that the attitude of the public is becoming distinctly more favorable. This may be because agitation has served to educate, to some extent, those who are not wilfully blind, and it may be because the investigation and prosecution of the large industrial combines have, for the time being, led the scent away from the much-hunted public utilities.

The papers which will be read cover almost every phase of the gas business. It is to the Gas Institute itself that I propose to devote the most of the time which a presidential address is expected to occupy. There are a few members of the Institute who feel that it does not accomplish the purpose for which it was organized. There is a considerable number of members who feel that the work which it does do might be done more efficiently.

I think it will be admitted that the membership of the Institute comprises very nearly all of the men engaged in the gas business in North America, whose experience, whose ability, and whose opportunities would enable them to contribute anything of value to the work of the Institute. Nearly all of these gentlemen are enough interested in the work of this body to leave their homes and attend its meetings. Many of them are willing to undertake the labor and responsibility incident to service on committees. and the preparation of papers. If the willing co-operation of so many able men does not produce the proper results, then it is a reproach to a very large part of the membership; for it must be borne in mind that many of our members are men whose business in life is to organize, to combine the labors of many persons, and to secure the best results from such combined efforts. I am one of those who feel that the Institute has done a great work in the past; that it is doing a great work now, and that it will continue to do a great work in the future. When I speak of the Institute, I speak of it as the legitimate heir of the three Associations from which it was developed, and of the various State Associations which owe their existence to it, or to the earlier bodies out of which it was formed.

When it is realized that, but for the Gas Institute in this broad sense, there would be practically no text-books on American gas engineering, that each company would have had to depend on its own experience for all improvements which differentiate its present plant from what it was 25 years ago, we will realize the work which the

various associations have done and are doing for the gas business. Let each man recall to mind the many devices which are producing revenue and saving money for the companies which he represents, and then ask himself what proportion of them was suggested by words heard or papers presented at some of the association meetings. He will then realize the debt which his company owes to the gas associations. For my own part I believe that the work of the various associations, and of the Gas Institute to which the efforts of all of them finally come, are worth more to the ordinary gas company than an engineering department of its own, costing many thousands of dollars each year, and doing the best that it could, but without the reports of the work done in other places which the Institute furnishes.

It ought, however, to be the aim of all of us to make the Institute the most efficient body possible; and, in order to work intelligently towards this end, it is necessary that there should be some agreement as to how the end can be accomplished. All progress is the working towards an ideal, and before progress can be made along any definite lines, the ideal aimed at must first be pretty clearly defined. I know of no way in which men can agree on any proposition except that some one should state the proposition, see how many will agree with it, and then change it and discuss it until it meets the views of the majority. As a step in this direction, I am going to state my own ideal of what the American Gas Institute should be.

I believe that it should combine the functions of a social club, a trades' union and a society for scientific research; a social club, in that it enables its members to meet agreeable gentlemen who are interested in the same subjects that oneself is interested in; a trades' union, in that the combined influence of all the membership can be brought to bear to shcure any lawful and equitable advantage, or to resist any unjust or illegal measure; a society for scientific research, in that it preserves and lays before its members full reports of everything that is done in applied science, so far as it relates to the gas business.

Little need be said concerning the first two functions. Most of us find the Institute a very agreeable club, and most of us would feel lonely indeed if we were deprived of the friendships which have grown out of its meetings. Concerning the trades' union idea, the laws which bless or blight our business are not national ones; they are State laws, and the most that the Institute can do is to point out to the companies in each State what has been done in other States, and how laws of various sorts have worked in practice. Experience has shown that information of this sort, presented at the right time, has proved the most powerful weapon for preventing the passage of bad laws.

It has been suggested that the Institute could in some way arrange for the better protection of the vast financial interests represented by its members; that something could be done towards discouraging the formation of competitive companies in localities which are already well-served by existing companies. The laws of some States which have created public utility commissions have provided for this matter in a very fair and just way. The present is a bad time for any body, or any other organization, to make any move which could possibly be made to appear as a combination in restraint of trade. It is a fact, however, that every member of this Institute is a guest in any gas works which he chooses to visit. He is allowed to see all processes, he is informed as to costs and figures. That he should afterwards use information acquired in this way to the detriment of the companies supplying it, would certainly be a violation of the laws of hospitality; and if there is any doubt at present that such conduct would be condemned by the public opinion of this body, then that doubt should be removed. Generally speaking, however, the American gas companies not only have no secrets, but their attitude is that of beseeching the people to inform themselves as to the business, and in this way become convinced that the service which they render is an honest service, worth all that it costs the consumer, a service which costs the company so much as to leave only a fair margin of profit over and above that cost.

In order to perform its functions as a society for scientific research, I do not believe that the Institute should attempt, through committees or otherwise, to engage in original investigation. Every subject which can be of importance to a gas man becomes acute at some time or other in the various works in which our members are employed. When such questions become acute, they are investigated by men who have the keenest interest in their solution, who have a gas works in which to try experiments, and who have trained assistants, ready and willing to carry out suggestions. Certainly the Institute itself cannot get work done under more favorable circumstances, and when the work is finished and a complete report of it published in our proceedings, it is the best that we can hope to do. It is, in my opinion, something very well worth the doing, but something to which we have all become so accustomed that our appreciation of it has been somewhat dulled.

I can see no advantage to be gained either by a very large membership or by a very large revenue. When our membership includes all the men in North America, who are able to bring something to the meetings, and take something away from them, then it would be worse than useless to try to make the membership any larger. When our revenues are great enough to pay all of our legitimate expenses, to prevent the Institute from becoming a burden on any of its friends —whether they are printers, manufacturers or those in whose homes we decide to meet – then I think that its revenues are large enough. Include as "legitimate expenses" the bringing before our members as lecturers those eminent scholars whose work serves to advance the boundaries of science so far as the latter is applied to our own business.

I have heard the suggestion made that the Institute ought to advertise gas in the magazines of national circulation. It must be remembered that a very large proportion of the readers of the magazines live in the country and in small towns, where they could not get gas if they wanted it. I think it evident, therefore, that money spent for advertising which reaches more directly the people that it hopes to reach would be better spent and, in short, that the local gas companies who are to profit by this advertising are the parties to furnish the money and to control its expenditure. Money spent locally not only reaches the people whom it is desired to reach, but also does its part towards making friends for the company where it needs friends—that is, at home.

I know it seems somewhat eccentric to say that the Institute does not want either money or members; but I believe that a mad race, either for a large membership or a large revenue, is apt to destroy much that is most valuable in a body such as this. As I said above, we have no use for, and should take no pride in, any larger membership than that which takes in all the desirable men in our territory, nor any larger revenue than that sufficient to accomplish the objects for which the Institute exists.

The principal object is the promotion of the best interests of the members and of the companies which they represent. The report of the Secretary has shown the condition of the Institute as to membership and as to finances. I consider that condition excellent and the outlook for the future most encouraging.

A New Type of the Brown Electric Recording Instrument.

A new type of electric recording instrument, particularly adaptable for use as a recording electric pyrometer, recording voltmeter or ammeter, has been designed by the Brown Instrument Company, of Philadelphia, Pa., well-known makers of pyrometers. Recognizing the necessity of a recording instrument, which is accurate in operation and simple in construction, the Brown Instrument Company folks have spent much time in designing a recording instrument that can be mounted on the wall or switchboard and used by the most inexperienced workman.

In the common form of recording instruments no means are provided for shifting the recording pen arm out of the way when the chart which received the record is changed, consequently there was serious danger of bending the pen when removing the chart. In this respect the new recording instrument is most novel in construction, in that its essential parts are mounted on the door instead of in the case. The clock mechanism and chart alone remain in the case when the door is opened; consequently there is no possibility of bending the pen, since there is no occasion to handle it for any reason whatsoever. As soon as the door is thrown open the entire voltmeter system and the inking device swing aside automatically, permitting the old chart to be easily removed and a new one substituted.

Figure 1 shows a photograph of this recorder, in operation with the door closed; Fig. 2 shows the instrument, with the door thrown open, ready to have a new record chart installed.

The millivoltmeter system, which is used in this new recording instrument, is a simplified form of the D'Arsonval system, which is the only method used in electrical instruments of precision. Also, the recording pen comes in contact with the paper momentarily only, for the purpose of making a dot, thereby eliminating all friction between the pen and the chart.

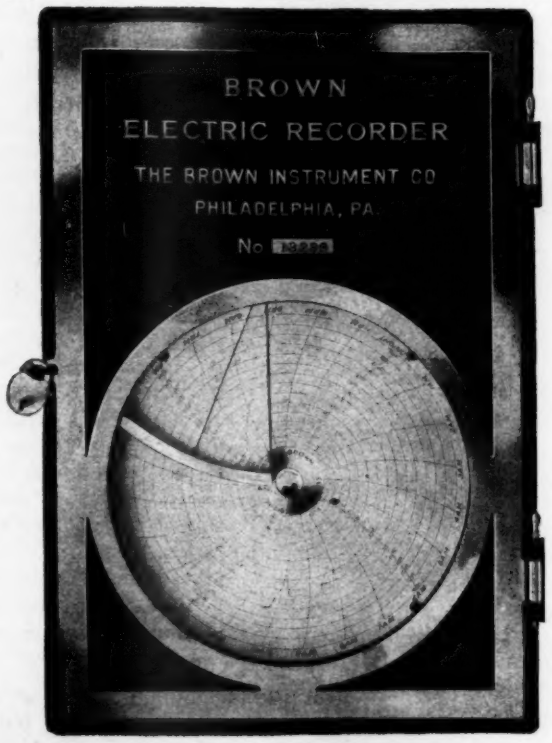


Fig. 1.—New Electric Recording Pyrometer.

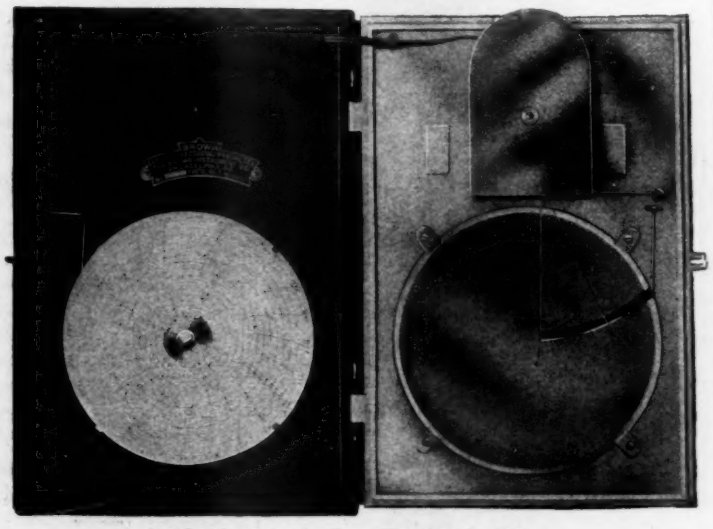


Fig. 2.—Recorder Open, Showing Simplicity.

An inking pad is placed immediately beside the pen. It carries sufficient ink for a week's supply, and the inking pad frequently touches the pen point keeping it damp. When the door is closed the arm seen at the left of photograph (Fig. 2), and operated by the clock mechanism, comes in contact automatically with the inking device; and every ½-minute, or ¼-minute if preferred, it pushes the inking pad away from the pen, permitting it to swing freely. It then falls, allowing the inking pad, by its own weight, to press the recording pen against the paper.

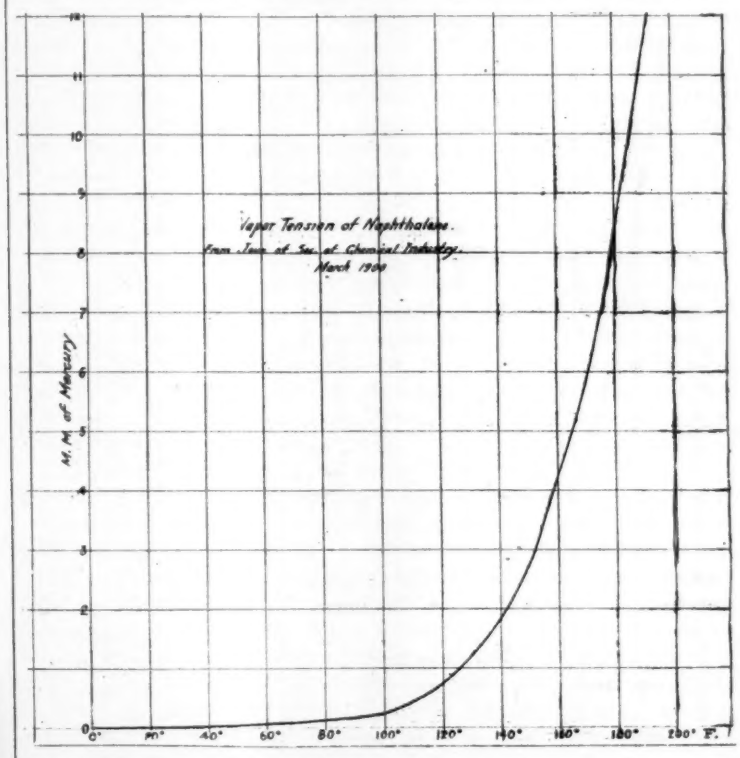
An instrument so simple and free from unnecessary parts, and operating without friction on the paper, has not heretofore been designed, which can be clearly realized by an examination of Fig. 2. In no other apparatus is simplicity more desirable than in recording instruments, and the simplicity and the improved features of this new recorder will particularly appeal to those who have come into contact with the delicate construction of electrical recording instruments heretofore on the market.

The Naphthaline Problem in Oil Gas Manufacture and Distribution.

[Prepared by Mr. F. S. Wade, Chemist to the Los Angeles Gas and Electric Corporation, Nineteenth Annual Meeting, Oakland, Cal., Sept., 1911.]

In this paper I will not attempt to offer any new theories concerning naphthaline, its formation, deposition or removal; too many have already been offered. I will only endeavor to state the theories which most closely follow invariable physical laws and the facts, as I have observed them.

Let us, first, consider the nature and origin of naphthaline. As we only too well know, it is a white, crystalline, solid hydrocarbon, 93.7 per cent. carbon, and 6.3 hydrogen; it has a melting point of 176° F., and boils at 424° F. At the ordinary temperature, its vapor tension is very low; but, as will be seen by the attached curve, one



that rises very rapidly with increases in temperature above about 90° F. It has the rather peculiar property of passing from a vapor to a solid with no intermediate liquid condition, and this property, more than any other, causes its intensely objectionable features as a hydrocarbon in illuminating gas.

Naphthaline is quite generally formed when organic substances are decomposed at a red heat. For example, it is readily made in the laboratory by passing alcohol, ether, benzine and acetic acid through red hot tubes. I have made, when experimenting with the decomposition of California petroleum in a small iron retort, at a temperature below 1,600° F., naphthaline in sufficient quantities to quickly stop up a ⅜-inch off-take pipe. It may, therefore, be safely stated that any process of making gas, of say 20-candle power, or 640 B.T.U.'s from petroleum, will make more than enough naphthaline to saturate gas as it leaves the washbox at a temperature of, say 150° F. This statement is readily proved by the fact that a small quantity of solid naphthaline is invariably found in the carbon from the washbox, showing that an excess of naphthaline crystallized out when the hot gas coming from the generator was cooled on striking the water in the washbox. There can be no doubt that very high temperatures in the generator make excessive quantities of naphthaline, but this extra amount will appear only as a greater percentage in the carbon and tar places where it does no particular harm. It is my opinion that any effort looking to the elimination of naphthaline trouble by doing away with its formation in the generator is misdirected.

If we admit that considerable quantities of naphthaline will be made by the oil gas process under the most favorable circumstances of manufacture, the question then becomes how best to prevent its depositing in troublesome quantities and places. The vapor tension of naphthaline is such that the following quantities are carried by gas when saturated:

Temperature, Degrees F.	Grains per 100 Cubic Feet.
50	7
60	13
70	24
80	42
90	71
100	117
110	182
120	276
130	403
140	628

At these various temperatures 100 cubic feet of gas can carry the number of grains stated and no more. It is, therefore, evident that,

if gas leaves a works saturated with naphthaline at 80° F., and encounters somewhere in the distributing system a temperature of 60° F., 29 grains of naphthaline will be deposited for each 100 cubic feet of gas; and, worst of all, wherever a drop in themperature is encountered, naphthaline is deposited in a small space, in the form of thin crystalline plates, growing out from the interior surface of the pipes at right angles to the flow of gas. This habit of crystallization enables a minimum weight of the solid to offer a maximum of obstruction to the flow of gas.

A great deal has been said and written about the effect of water vapor, benzol, ammonia and other vapors upon the deposition of naphthaline. Experiments to study these points were made by holders of the Gas Engineering Fellowship, of the Michigan Gas Association, at the University of Michigan, under scientific conditions which would be difficult to duplicate in the industrial gas laboratory. The results of these experiments were published in the "Proceedings" of the Michigan Association for 1905, and may be consulted at length therein. It was found that, with the single exception of gas containing benzol vapor, the nature of the mixed vapors or gases, of which naphthaline vapor formed a part, had no effect upon the vapor tension of naphthaline. In other words, crystals of naphthaline would be deposited in the same quantities at the same temperature from air, hydrogen, acetylene, dry coal gas, coal gas saturated with moisture, or heavily charged with ammonia. It appeared that gas containing a considerable amount of benzol vapor was able to carry a greater quantity of naphthaline without deposition. Benzol is not, however, found in sufficient quantities in oil gas to have any serious effect.

In view of these facts it may be safely stated that the only important factor in naphthaline deposition is temperature change. It may also be stated that, so long as gas reaches, before leaving the works, a temperature as low as the lowest it will encounter in the distributing system, there is no possibility of naphthaline being deposited. Unless a plentiful supply of cold water can be had, this condition of temperature is hard to obtain in the works, so the problem becomes how to reduce the naphthaline content to a safe point, when unable to reduce the temperature.

One method of successfully obtaining this result can probably be best described by briefly stating the experiences through which the Los Angeles Gas and Electric Corporation passed. The water supply of this Company was entirely inadequate to reduce the gas to a temperature which would keep large amounts of naphthaline from leaving the works. The average temperature of gas leaving the purifiers was always 80° F., and at times of water shortage was well over 100° F. At all temperatures, according to picric acid tests, the gas was saturated with naphthaline. Cool city water was used in the station meters, so that the gas suffered quite a drop in temperature upon entering them, with the result that the meters became completely blocked with naphthaline in about two weeks. They then had to be shut down and steamed for 24 hours, during which time about 100 pounds of solid naphthaline would melt and run out. Sixteen inch mains, leading from the works to the storage holders, had to be steamed out at similar intervals. Complaints from consumers of stoppages were exceedingly numerous, and at the time of installing the first oil scrubber (July, 1906), had reached over 500 a day.

Every effort was made to reduce the temperature of the gas at the works, and at one time even the installation of a refrigerating system was considered. A small scrubber, using 45° B. distillate as a solvent, had been installed 2 years before and was successful in handling a small volume of gas; but it was expensive in operation. Experiments were made with tar from the works as a solvent, but it was found in all cases too highly saturated with naphthaline to be of further use. In some cases the tar actually gave off naphthaline to the gas it was washing. Fuel oil of 16° B. was tried in an experimental scrubber with results so gratifying that a water tank, 20 feet in diameter by 60 feet high, was hurriedly converted into a scrubber, and the fuel oil supply of the plant used to wash the entire gas output. The amount of naphthaline was reduced to about 15 grains per 100 cubic feet in the gas leaving the scrubber, but on account of the great number of stoppages then occurring, it was desired to send out gas altogether free from naphthaline. The entire supply of gas oil (19.5° B.) was, therefore, turned through the scrubber, with the result that, so long as the gas entered at a temperature not much above 90° F., it went out so clean that a picric acid test run for 9 hours showed no precipitate. Whenever gas at the inlet reached a temperature of 95° F., amounts of naphthaline, increasing with the temperature, passed through the scrubber. This is explained by the rapidly increasing amount of naphthaline carried into the scrubber as the gas grew hotter. The same oil has been used for removing naphthaline, and subsequently in the generators for making gas, at this plant for 5 years, and so far absolutely no bad effect has been noticed on account of this practice.

The very fact that crude oil would dissolve and remove the vapor of naphthaline from gas, led me to suspect that it would also remove serious amounts of other more abundant and valuable hydrocarbons. Therefore, I made, early in the experimental stage of oil scrubbing, a careful investigation of its effect upon the quality of gas. Tests with Junker's calorimeter and a bar photometer failed to show any appreciable loss in calorific or lighting value, and gas analysis did not show any change in the percentage of hydrocarbons absorbed by bromine. It is possible that there is an exchange of hydrocarbons between the gas and the crude oil, but, whatever the action, there is no detectable change in the commercial quality of the gas treated. Gas saturated at 70° F. contains .01 per cent., by volume, of naphthaline vapor, or a cubic foot contains .21 grains having a heating value of 0.6 B.T.U. Assuredly the removal of these amounts of naphthaline alone cannot very seriously affect the quality of the gas.

The effect of oil scrubbing upon the organic sulphur content of gas was also investigated, and no appreciable results were recorded with the oil being used. It certainly would not do to wash gas with oil containing free sulphuretted hydrogen, as found in the oil produced by some wells in the Sherman and Coalinga fields.

Immediately after the installation of oil scrubbing the reduction in naphthaline complaints was slight, if any, and the practical success of the system was severely questioned, even though chemical tests showed it to be doing all that could be desired. No trouble whatever was given by the station meters or large mains from the day that the first oil scrubber was put in use. A considerable decrease in the number of complaints was noticed in about a month, and from then on the number gradually lessened and the complaints came farther and farther from the works. As late as two years after commencing oil scrubbing, during certain short periods of hot days and cold nights, as many as 100 stoppages were reported in a single day. During the past year complaints of naphthaline have entirely disappeared, not a single case having been reported in several months.

The long time required for the disappearance of trouble is accounted for by the fact that the entire distributing system, including the storage holders, was very heavily charged with naphthaline, which the clean, warm gas leaving the works readily absorbed, only to deposit farther out when a lower temperature was encountered. Numerous tests were made from time to time, showing the cleaning of the system in progress. At an early period clean gas from the works was practically saturated when leaving the storage holders ¾ of a mile away. Later on the gas did not contain serious quantities of naphthaline until it was 2 or 3 miles out. The greatest persistence of trouble occurred in the outlying districts where pipes had been longest laid.

The trouble given by gas delivered directly from the high pressure system was always much less than on the low pressure. Some trouble, however, was caused by minute quantities of naphthaline (often a single crystal) clogging the small openings in regulators. Gas which is saturated with naphthaline, compressed to 30 pounds a square inch, and subsequently cooled, while still under pressure, to its original temperature, must, on account of the known laws of vapor tension, drop ⅔ of its naphthaline. Therefore, naphthaline will be deposited in large quantities when hot gas from a compressor passes into pipes in the cool ground. In our system we found much naphthaline dissolved in an oily condensation deposited in drips within 2 miles of the compressor station. In this liquid condition it was entirely harmless and easily removed.

It is my opinion that the use of high grade gasoline for the removal of stoppages from service pipes is, in general, ill advised. There can be no doubt that naphthaline is readily soluble in light gasoline and that stoppages are easily and quickly removed and blown back into the main when it is used. The vapor tension of gasoline, particularly of high gravity, is much higher than that of naphthaline, and the gasoline solvent is, therefore, soon carried off by passing gas, leaving a large part of the naphthaline deposited, as before, in the main. If a solvent having a lower vapor tension, say stove distillate (34° B.) were used, a more permanent solution would be formed, which would have time to run to a drip and be pumped out. Likewise, a low grade petroleum distillate, heated to 180° to 200° F., and injected at the highest point, is much better than cold gasoline to clear a par-

tially stopped main. Nothing short of live steam applied for a considerable time will clean an entirely stopped main.

As to the form of the oil scrubber itself and its mode of operation; in the plant mentioned, scrubbers 20 feet in diameter by 60 feet high are used. Gas enters through a 30-inch pipe about 7 feet from the ground and leaves at the top. Layers of 2 by 4 pine timbers, laid on edge, leaving a 2-inch gas space, are placed throughout the height of the scrubber. The timbers in successive layers are arranged to form a spiral, so as to thoroughly mix the ascending gas with the descending oil. A 10 by 6 by 12-inch double-acting pump is used to raise oil in a 3-inch pipe and discharge it through six openings, ¾-inch in diameter. About 4 feet of oil is maintained in the bottom of the scrubber, which is used for circulating in connection with enough fresh oil to keep the mixture far below saturation with naphthaline. Of course, as fast as fresh oil is drawn in, old oil goes out into the works' lines and is used. A scrubber such as I have described, using about 4 gallons of fresh oil per 1,000, and enough oil used to keep a pump of the above size running at a normal speed, is capable of reducing the naphthaline of 10,000,000 cubic feet in 24 hours, from 70 grains to 5 grains per 100 cubic feet.

A few words as to the method which I have found most satisfactory for determining the amount of naphthaline in gas may be of interest. A solution of picric acid is prepared by dissolving with gentle heat 12 grammes of the acid in 1 liter of water. If not clear, the solution should be filtered and then standardized by titrating 20 cubic centimeters with 10th normal caustic potash, using lacmoid indicator. Two hundred cubic centimeters of the solution are placed in an all-glass gas washing bottle. The gas to be tested bubbled through it, and thence into a meter, at a rate not exceeding 2 cubic feet an hour. After not less than 10, or more than 40, cubic feet of gas have passed, the bottle is disconnected and the solution filtered. I have found, in our southern California climate, any special precautions, such as warming before filtering, quite unnecessary; 20 cubic centimeters of the filtrate are titrated, as when standardizing the original solution and the number of cubic centimeters of $\frac{n}{10}$ caustic potash required to neutralize the used acid is deducted from the number required by the original solution. The result is multiplied by 197.1 (= 10 = 1 by 100 by 15.4 by .0128), and divided by the number of cubic feet of gas tested, which gives the number of grains of naphthaline per 100 cubic feet. It is very important that the gas should pass directly into the washing bottle without the intervention of any rubber tubing, as rubber absorbs naphthaline readily. The use of a train of several wash bottles, as recommended by most text books, is unnecessarily tedious for commercial testing.

Mechanical Handling of Carbon By-Product of the Oil Gas Process.

[A paper prepared by MR. D. J. YOUNG, Supt. Gas Mfg. Section, Los Angeles Gas and Electric Corporation, for the Nineteenth Meeting, Pacific Coast Gas Association.]

The carbon by-product of oil gas manufacture has long been the bugaboo of the oil gas engineer. This is a material of undoubted value which, instead of being an asset, has, on account of the cost of recovery, become almost a liability. Several methods have been devised for handling this carbon, which, on a small scale, were fairly successful; but, when applied on a large scale, they were costly, occupied valuable ground space, and did not give the satisfaction which they should. The large quantity of gas which the Los Angeles Gas and Electric Corporation was making, the very high value of land in the neighborhood of the plant, and the fact that the former method was unsatisfactory, forced us to give the matter a most careful study, and now we have a plant which I believe has solved the problem.

Without taking the time to detail the experiments, both successful and unsuccessful, which we have made, I will describe the essential features of our equipment for handling this by-product from the time it leaves the washbox of the generator until it is in a finished form, and I wish to call particular attention to the fact that at no time need it be handled except mechanically. Portions of this plant are not yet completed, but the first installation which has been in regular operation for some time has demonstrated that the principles involved are correct.

From the washbox the water, which contains the carbon, goes into a seal-pot near the operating board of the generator, which seal overflows through flumes or pipes into a pit, the pit caring for the water from all the generators. The water contains from 1 per cent. to 2 per cent. carbon. From this pit it is pumped by ordinary centrifugal pumps to our carbon plant, which is located about 2,000 feet from the pump house. These centrifugal pumps give excellent service. The water is delivered from these pumps into settling tanks, installed in duplicate to admit of cleaning.

In these settling tanks two operations are performed. First, all heavier particles, such as stand pipe carbon, ashes and balls of tar are precipitated to the bottom; second, a portion of the water is removed.

There are two methods for removing the surplus water. Each is essentially a canvas filter to remove a portion of the water, leaving the balance of the water and the carbon in the tank, with suitable means for keeping the carbon from packing on the canvas and stopping the water from being drawn through. One of these is a leaf filter, similar to those common in the cyanide process, and the other is a pancake or disk filter, which is also adapted from the metallurgist. By these methods we remove from 50 per cent. to 75 per cent. of the water; but sufficient water is left with the carbon so that it is fluid and can be easily handled by the following apparatus. From the settling tanks the carbon is taken into a continuous-drum separator. I will describe this piece of apparatus a little more fully, as it is the most important feature of our process.

Briefly, this separator may be described as a drum with open ends 11 feet 6 inches diameter by 16 feet width of face, supported on a horizontal axis in a tank, and partially submerged in the liquid or pulp to be filtered. The outer surface of the drum is divided into longitudinal sections and covered with a filtering medium. Vacuum is applied to the sections and, as the drum revolves, a cake of carbon forms on the surface. As the sections leave the liquid the cake is dried by the air being drawn through. Just before any one section enters the liquid again, air under low pressure is admitted to this section and the cake of carbon is discharged over a scraper or apron resting on the drum. The cycle is then repeated, the whole operation being continuous and automatic.

The following is a detailed description of the separator: The periphery of the drum is built up of redwood staves, firmly bolted to cast iron spiders with steel arms, and is made absolutely water tight. The outer surface of the redwood staves is divided into a series of shallow compartments or sections with their dividing partitions running parallel to the shaft. In each section is a grating of grooved wooden strips, on top of which is fastened galvanized wire screen, which serves as a firm, smooth, backing for the filter cloth. This cloth is made in one sheet, large enough to cover the whole drum, and is stretched tight, being held in place on the ends by rope caulked into a groove cast on the ends of the spiders. To protect the filter cloth from wear, to hold it in place and to act as a guide for the scraper, No. 14 galvanized steel wire is wound tightly around the drum, spaced about ¾-inch pitch. A thin, steel, scraper which serves to remove the dried carbon, rests on this wire, and is thus kept very close to the filter cloth without touching it.

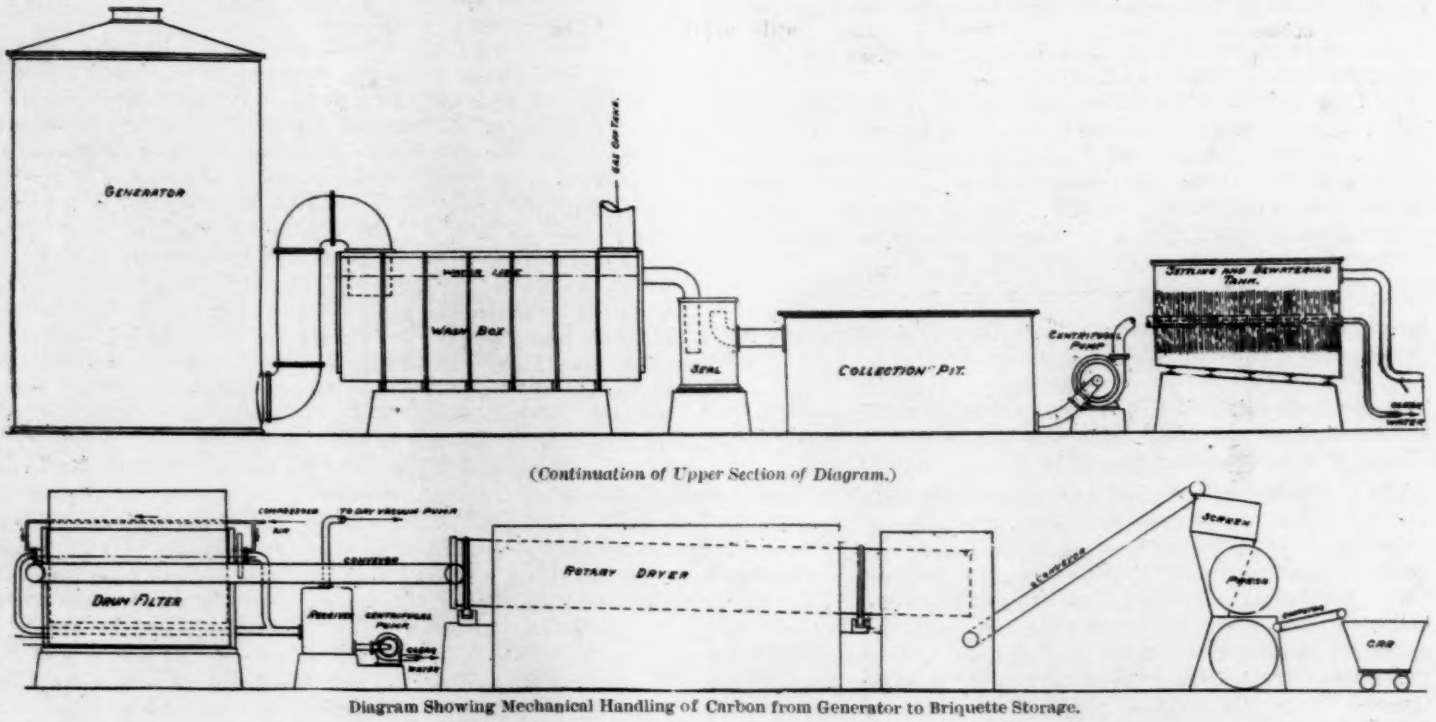
Each compartment is connected to the vacuum receiver and to the compressor by two sets of pipes which are carried radially to the shaft, then passing in two concentric circles through the trunnion to the automatic valve. This automatic valve consists of a flat valve-plate or seat into which are screwed the vacuum and compressed air pipes leading from the various compartments in 2 concentric circles of 12 ports each. The valve proper is stationary and consists of a cast iron chamber ground to fit the valve seat. In the face of the valve is cut an annular slot or port, which registers with the outer circles of holes. Into this slot is fitted and adjustable bridge, long enough to at all times cover one port in the valve seat, in this way cutting off the vacuum from one section of the filter. The valve is held against its seat by atmospheric pressure and is prevented from turning by an adjustable valve stem. A single "blow" port is placed so as to admit compressed air through the inner circle of pipes to the section from which the vacuum has been cut off. By means of this valve each section, in succession, is "blown" without affecting the remaining sections, the cake being thus released and the pores of the filter cloth cleansed at each revolution. The air and the water from the sections go to a vacuum receiver which is connected to the wet and dry vacuum pumps. The water is handled by a water-sealed centrifugal pump, while the receiver is exhausted by a dry vacuum pump. The water which comes from both this separator and the disk or leaf filter is practically clear and can be used again or discarded, as the needs of the plant call for.

The carbon as delivered by this separator contains from 40 per cent. to 50 per cent. of moisture, and before being used it must be further dried. We convey this carbon direct to a rotary dryer, very similar to a cement dryer. I need not describe this, further than to say that it is a very satisfactory machine, easy of operation and presents no operating difficulties. I would note, however, that we get the best results from this dryer by the use of a pyrometer, the fire end of which is placed in the drying chamber, enabling us to maintain a regular heat and get a uniform product. The carbon is delivered from this dryer containing from 15 per cent. to 20 per cent. moisture. It is then carried by conveyors to a screen with about ¼-inch mesh, where the lumps are removed and the fine carbon is deposited into a bin. This bin feeds direct into the hopper of a briquette or brick press. This latter is similar to an ordinary pressed brick machine, slightly modified for handling carbon. With these presses the carbon is made either into a brick form, for water gas or boiler fuel, or into a briquette for a commercial fuel. The briquettes or bricks are carried away from this machine on a belt conveyor and delivered into cars, wherein they are carried to storage yards.

While the bricks or briquettes, as they leave the machine, are apparently very strong, they are not ready for use until they have been seasoned or air-dried. In air-drying the briquettes we pile them from 4 to 6 feet deep and leave them from 3 to 6 weeks. This should be done under cover. The briquettes as we make them are cylindrical in form, 2 inches in diameter by 2½ inches high.

The only particular feature of the briquette press that should be mentioned is the use of a bronze mold box and dies in preference to steel. On account of the very great pressure employed in the presses, the wear on a steel mold box and dies is very great; furthermore, the steel rusts, which causes trouble on account of carbon sticking to the molds. With a bronze mold box and dies, there is no rusting, and consequently no sticking of carbon to molds, and the wear is much less.

Attached to a diagrammatic sketch, showing each step in the process from the time the carbon is produced in the generator until it is ready to be used or sold.



(Continuation of Upper Section of Diagram.)

Diagram Showing Mechanical Handling of Carbon from Generator to Briquette Storage.

The cost of handling carbon by this method is largely dependent on local conditions, but I will give approximate capacities of the apparatus and amount of labor necessary. It is obvious that the cost of such items as pumping and conveying is dependent on the distance and height the material must be moved, and, under very advantageous conditions, this travel could be almost entirely by gravity.

The separator requires 30-horse power to operate and the machine can be handled by one man. Its capacity is rated in gallons of water, not tons of carbon, one machine handling about 25,000 gallons per minute, and removing all the carbon therefrom. We have two dryers, one of 40 tons per day the other of about 55 tons per day capacity, figured on material as delivered at about 20 per cent. moisture. Each used 20 to 30-horse power and requires one attendant, using carbon or oil for fuel.

We have two briquette presses, each of 4 tons per hour capacity. It requires 2 men and about 35-horse power to operate each. By changing mold-box and dies, bricks can be made on these presses. We also have 2 brick presses, one of 2 tons and one of 1 ton per hour capacity. The storage of briquettes and bricks is simply a question of location and can be arranged to be handled very cheaply.

While at present we use carbon for boiler fuel and water gas fuel, and manufacture briquettes for sale as commercial fuel, our experience has proven that briquettes for commercial fuel yield the greatest value per ton for the carbon, and therefore receive first consideration in our plant.

As to the market for briquettes. This is also a local condition; but, with the prevailing prices for coal on the Pacific Coast, the market should be easily established, especially in view of the admitted superiority of briquettes over any other solid fuel. The following is an average analysis of the briquettes as delivered to our consumers:

Content.	Per Cent.
Moisture	3.94
Volatile and combustible matter	11.41
Fixed carbon	83.94
Sulphur	.51
Ash	.20
British thermal units per pound	14,540

Tests on carbon briquettes (made according to United States Government specifications) for breakage, show results which are very favorable, compared with either coal or other forms of briquettes.

The Early Development of Gas Lighting.

[A paper prepared by Mr. M. R. Morgan, for the Nineteenth Meeting, Pacific Coast Gas Association.]

Geology of Coal, Oil and Natural Gas.—To discern the ultimate sources of the gas industry we must look far beyond the brief history of mankind, and even through the later geological eras, to a time involving many of the fundamental riddles of terrestrial science.

If it is asked "Where does gas come from?" We answer, from coal and oil; but, whence came the coal and oil? An attempt to answer this question takes us back to the first Biblical day when "The earth was without form, and void." Astronomers tell us that during that period all earthly elements were whirling through space in the form of an extended volume of tenuous gas, carrying in suspension "The dust of continents to be;" that after a succession of ages, the earth was evolved gradually by the slow process of gaseous and atomic condensation; eventually a foundation of igneous granite was deposited, and dry land appeared; then came the Silurian and Devonian ages, followed by a carboniferous limestone formation which immediately preceded the strata of petrified vegetation that

now, after thousands of years, compose the great coal measures of the earth.

"The period represented by the rocks of the Coal Measures was one of the most remarkable of which there is any record in the geological history of our planet. Enormous areas of the earth's surface were covered with dense forests, which grew in lagoons and marshy situations. The whole land must have been very flat, and little above the level of the sea—a sort of fen land, or something similar to the great deltas of tropical rivers, in which wide expanses are occupied by sluggish streams and lagoons of fresh water, where the mangrove grows along the shores, and the bottom is covered with water-logged, decaying vegetation. The climate was warm, equable and moist, and the atmosphere relatively rich in carbon dioxide. The growth of vegetation must have been rapid, and dark evergreen plants and ferns lent a somber aspect to the scenery. As yet there were no flowers, no birds and none of the higher quadrupeds. Prolonged, but very slow, subsidence was in progress, and when for many years the marshy vegetation had densely clothed the soil, it was carried down below the water and covered over with mud or sand, to form eventually a seam of coal."[1]

These carboniferous deposits have been found in all lands, those in some parts of the United States being more than 18,000 feet thick; in Germany, 10,000 feet; and in Lancashire, England, 13,500 feet.

Following the Coal Measures came the Mesozoic and Tertiary periods; during the former the continental land areas were defined and animal life rapidly developed. It was in this age that the great amphibians appeared—immense creatures, half-fish and half-reptile; the air was filled with flying lizards, having wings armed with claws and necks 10 feet long; through dense tropical forests roamed the carnivorous dinosaur, an animal 60 to 80 feet in length and weighing 20 tons; a huge brute with the strength of a mammoth, the teeth of a crocodile and the ferocity of a tiger. During these unnumbered centuries the swamp accumulations of vegetation and animal matter sank lower and lower, and were carbonized under high temperature and enormous pressure. The oil vapors ascended to higher and cooler strata and condensed as petroleum; in many cases the volatile ingredients of the oil evaporated or became oxidized, leaving only the heavier hydrocarbons in the form of bitumen, pitch or tar. The fixed gases filled cavities in the rock, or escaped through fissures to the atmosphere.

According to our best knowledge, man appeared upon the earth some time during the Pliocene age of the Tertiary period. Undoubtedly all coal and oil-bearing strata were deposited long before this time. It is not known with any degree of certainty how long in years these periods were, or even the length of time man has required to emerge from the darkness of barbarism to a state wherein he had the desire and intelligence to produce light. We know that he was familiar with the use of fire before the beginning of history, and flame illuminants were the earliest sources of artificial light. The camp fire of the prehistoric barbarian was probably kindled as often for the sake of light as for warmth or for cooking purposes, and, having fire, it was a natural and simple step for him to snatch up a blazing brand and thus obtain a torch.

Ancient fire pans were merely portable fires, and were the result of the first crude attempt at artificial illumination. These fire pans and "brazen censers" are mentioned in the bible at a time decided by biblical students to have been about 1450 B.C. Homer, who lived about 1200 B.C., mentions "metal braziers filled with blazing pine knots," and in the 18th and 19th book of the Odyssey several references are made to torches as the means used for lighting dwellings.

Origin of Lamps and Candles.—The inflammable nature of animal and vegetable oils must have attracted attention at an early date, and it was a pregnant moment in the history of mankind when some primitive Edison picked up a shell or a hollow gourd, filled it with oil, lighted the rush wick and held in his hand a lamp—the first mechanical appliance in the world to produce artificial light, and one of the greatest instruments of civilization ever invented.

The date of the first lamps may be placed roughly at about 500 B.C., as they were not mentioned before that time. Herodotus, the "Father of History," records that, during the fifth century, B.C., asphaltic oil was collected from the surface of a lake on the island of Zante, off the coast of Greece, by swabbing it up with branches of myrtle, which were allowed to drain into stone vessels and the oil used in lamps. Pliny the Elder, in the first century, B.C., described springs of petroleum on the island of Sicily, and the use of petroleum in lamps; it was then known as "Sicilian oil" or "rock oil." Marco Polo, the noted Italian traveller and historian, writes that in Armenia he found "A formation whence rises oil in such abundance that an hundred ships might be at once loaded with it. It is not good for eating, but very fit for fuel." Early Greek and Roman lamps closely resemble shallow shells, and were filled with petroleum or olive oil in which floated a wick of fibrous material. Later came lamps of burnt clay, bronze and even gold, richly carved and ornamented, but giving only a dismal smoky flame.

Candles were developed naturally by using harder fats moulded around porous wicks, and very likely were a decided improvement upon the early lamps. A candle is a perfect gas plant, the wick being merely a vehicle to carry the rich hydrocarbons from the reservoir of melted grease to the flame, where they are distilled, and gas liberated and burned.

The Discovery of Natural Gas.—All ancient writings, folk lore and mythology abound with references to "burning springs" and "sacred fires," which, after the lapse of many centuries, and in spite of idioms and accidents of translation, we recognize as descriptions of burning natural gas.

Plutarch, in his life of Alexander, mentions a place near Ecbatana, in Persia, where "Alexander was astonished at the sight of fire issuing in a continuous stream like a spring of water out of clefts in the earth." This must have occurred about 332, B.C., as the campaign against Persia was started in the year 331, B.C.

In Baku, on the shore of the Caspian Sea, natural gas has been escaping from the ground since the time of the fire worshipers, and here many sacred fires were fed in a very secular way by means of natural gas piped to the altars.

In various parts of Russia, China, Italy and India, the use of natural gas antedates authentic history. In a recent government report, Consul-General Wm. H. Michael, of Calcutta, India, writes as follows:

"Twenty miles from Chittagong natural gas issues from a crevice in the ground in considerable quantity. It has been burning so long that the oldest inhabitant can give no idea of when or how it was set on fire. The general belief among the natives is that the gas has been on fire for centuries. At any rate the gas flow has been burning as far back as any records have been kept by white people."

The Discovery of Coal.—Of all the minerals inclosed in the earth's crust coal is most abundant, the most useful and the most valuable to the human race. Without coal the world's industry would be threatened, transportation crippled, commerce destroyed, and man turned back toward that state of semi-barbarism out of which he has so painfully worked his way during the past 7 centuries. Modern civilization dates from the discovery and use of coal, and now we could better spare gold, silver, and precious stones, than do without the distilled sunlight so wonderfully preserved since the dawn of creation.

As far as we can understand, the geological condition favorable to the production of coal has passed forever. The warm, humid atmosphere, the peculiar condition of the earsh's surface, the abnormal vegetation have all been changed. Some idea may be gained of the enormous growth of vegetation necessary to form the coal measures when we consider that our modern forests would make a seam of coal only from 2 to 3 inches thick, while beds of pure coal have been found in Peru, and in Southern France, exceeding 100 feet in thickness. In South Wales, coal bearing strata exist having a depth of 11,000 to 12,000 feet, including about 120 feet of pure coal. At Westphalia, Prussia, 117 coal seams have been discovered making a total thickness of 294 feet, from which 30 to 50 million tons are mined annually.

Few countries are entirely without coal. Probably during the carboniferous ages the entire land surface of the globe was clothed with forests which became fossilized, but which in some cases have been entirely worn away and destroyed by later erosion and denudation. Professor Rogers estimates that existing coal beds in the United States include an area of about 200,000 square miles. This is all that remains of the vast deposits covering the whole Continent; the larger portion of the ancient bed having been denuded right down to the palaeozoic backbone of the country.

Prehistoric coal mines have been found in various parts of England, and the discovery of flint axes and other tools would indicate that they were made by men of the monolithic or stone age. In other localities coal ashes and cinders, found buried with Roman

(*Continued on page 282.*)

1. "Nelson's Encyclopedia."

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NEW YORK, MONDAY, OCTOBER 30, 1911.

[Special Editorial Correspondence by Telegraph.]

SEVENTH MEETING, NATIONAL COMMERCIAL GAS ASSOCIATION.

BROWN PALACE HOTEL, DENVER, COL., October 24, 1911.

Dear JOURNAL: The Institute meeting at an end, general orders for the Denver tryst of the National Commercial Gas Association were issued. Accordingly, at 2:15 P.M. of the 21st, our special (the St. Louis Colorado Limited, over the Burlington Route) started for the "City-in-the-Skies." The "Special" was a train *de luxe* in every sense of the term. As lined-up on the rails it consisted of a buffet car, 2 diners, a lounging-observation car and 6 sleepers. The party numbered 100, and although the start was made in the rain, it was a certainty that no dampening could be put on the party that would in any wise affect its jollity. We reached Denver Sunday evening, virtually on time, after a trip that was enjoyable each minute from the platform at St. Louis to the platform of the depot in the High City. We were closely followed by the "Chicago Special," the travellers by which fared as well as we did. They outnumbered us, through their contingent footing over 5 score. We were received most royally by the Reception Committee, who speedily conveyed us in autos bound to our respective stopping places. As we whirled along the streets we were treated to the main features of the exterior illumination, mainly arranged on account of the local electric show held last week.

The main thoroughfares were festooned from curb to curb by arched entwining of electric lamps enveloped in bulbs of red, the ensemble of which was strikingly attractive. Sunday evening was spent in exchanging greetings, and the spirit of brotherhood was everywhere. The real (or set) "doings" began at 9 of Monday evening, when, at the invitation of the Denver Gas and Electric Company, the visitors (at least 400 in number, of whom at least 4 score were of the gentler sex), thronged to its magnificent building, at 15th and Champa streets, where an informal reception was held. The proceedings were marked by a hearty welcome, a succession of musical selections by a well-trained orchestra, an abundance of refreshments, and a reception committee that did not leave undone a thing that it should have done. By-the-way, the ladies were well decked out with posies, the men plied with segars, and both sexes shared in pretty souvenirs of the occasion. The lighting of the building (both inside and out) was marked by elegance, amplitude and effectiveness, although the prevailing agent was the electric current. Leaving the ground floor the party inspected the second elevation of the perfect building, and here close view was had of many devices and appliances for the use of mistress and maid, master and man, to the bettering of all whether at home or abroad—the moving agents in these being either gas or electric currents. Right here let me say, once for all, that the Reception Committee, headed by Messrs. Frank W. Frueauff and John T. Brady; the Ladies' Committee, led by Mrs. Frank W. Frueauff, Mrs. W. J. Barker and Mrs. C. N. Stannard; and the Exhibition Committee, under the immediate direction of Messrs. W. J. Barker, S. A. Sewell, A. F. Traver and J. M. Connelly—all are entitled to unqualified praise and thanks for their successful ministrations. Their work was simply perfect. The city is brimming with action and go, for at least 250,000 people are within its limits to-night, many of whom are like the gas men—wayfarers in the hands of their hosts. No pen can do justice to the wondrous illumination of the place. It fairly glows and beams.—W.

BROWN PALACE, October 24, 1911.

Dear JOURNAL: The day opened bright and invigorating, although one might fairly say it was warm for October's closing days. President Clare N. Stannard formally called for order at 10 A.M., and the beautiful sessions' room in the Auditorium held well over 400 members when the gavel fell. The Hon. R. W. Spear, Denver's Mayor, royally welcomed the body and his welcome was gracefully accepted and acknowledged by President Stannard—he surely is a man of tact. Many letters of regret were read that the writers could not be present, and in the lists were the names of President George B. Contelyou, of your Consolidated Company; from President T. N. McCarter, of the New Jersey Public Service Gas Company; from Mr. Lewis Lillie, of U. G. I. Co.'s Philadelphia headquarters; and from Mr. John A. Britton, Secretary of the Pacific Coast Gas Association. The Report of the Board of Directors disclosed many important things. Amongst these were: The determination to compile and publish a book on all gas appliances; the Gas Salesmanship Course has 700 members—how's that? the total membership is 2,860—an increase beyond all expectation; balance to credit, $3,100. Several routine reports followed. Of course, these were indorsed. Next came the election to Honorary Membership (first and only one) of Mr. Lucius S. Bigelow, which promotion was heartily acclaimed. The reports read (which were all clear and generally concise) included that by Chairman J. M. Brock, which had to do with "Advertising and Publicity." This was a lengthy document, and it in the main followed along the lines put forth in President Ewing's presidential message to the Michigan Gas Association last October. That he was disinclined to act forthwith on so important a matter, the real pith of which is not at all evident to the rank-and-file just now, would seem shown by the referring of the Brock presentation to the Directors for 1911-12, with instructions to act thereon as soon as possible. President Stannard, in his annual address proved anew how closely that observant gentleman follows the salient goings on in the industry. The address was (as it certainly should have been) well received. This was followed by the report of the Committee on Place of Next Meeting, and great was the joy of Manager Congdon, of the Atlanta (Ga.) Gas Company, when that go ahead, modern Southern business mart was named. There is no question whatever that this naming was altogether due to Mr. Congdon's clever "advance work" in respect thereof. The session was completed by the reading and discussing of these papers: "Illuminating Engineering and Its Application to the Gas Industry," by Mr. E. L. Elliott; "Some Notions of a Manufacturer," by Mr. Robt. K. Clark, of Chicago—they were good "Notions," too; and "Pensions and Profit Sharing," by Mr. J. B. Douglas, of Philadelphia. In the afternoon the ladies enjoyed a power ride in and about the city, a luncheon, and a rather hurried inspection of the noted Museum in beautiful City Park. In the evening we all enjoyed the play at the Orpheum Theater, and retired with the effects of the wonderful illumination of Denver still dancing before our vision—no; there wasn't a symptom of "Dick Swiveller" connected with the flashings!—W.

BROWN PALACE, Oct. 25, 1911.

Dear JOURNAL: The second session was convened promptly at 10 A.M., and business was ushered in by the naming of the following office bearers for 1912:

President—Mr. C. L. Holman, St. Louis, Mo.
First Vice-President—Mr. P. S. Young, Newark, N. J.
Second Vice-President—Mr. C. M. Cohn, Baltimore, Md.
Third Vice-President—Mr. H. D. Schall, Detroit, Mich.
Treasurer—Mr. W. H. Pettes, Newark, N. J.
Secretary—Mr. Louis Stotz, New York city.
Directors—Messrs. J. C. Rushin, C. W. Wardell, F. M. Roberts, C. W. Hars and Geo. Williams.

The technical work was introduced in the paper by Mr. A. F. Traver (Denver), giving an "Exhibit and Description of a Model Glass Gas Works"—this was most interestingly shown; followed by Mr. Thos. R. Elcock's (Philadelphia), well-put together exposition of "Up-to-Date Advertising Methods." Mr. Elcock is not an old-timer in the art; but he certainly is quite up-to-date in his methods of "putting it before them." Beyond a doubt he will be heard from again. The session closed with a "Practical Demonstration," by Anna A. Carroll—the prefix is omitted, because of your scribe's unwillingness to take a chance over mixing matters. "Be that as it may," as a demonstratress, the lecturess is entitled to "place directly in the front of the orchestra;" so said one who reposes in a seat of the mighty. In the afternoon the main (in fact, all) business consisted of an inspection of the excellent exhibition of gas appliances, beautifully shown in another division of the Auditorium. To do this justice, of even the commonest sort, would require at least all the space that has been necessarily devoted to the reception of these despatches, so later on a proper account will be given thereof. Nevertheless it would be a dismal omission indeed if some mention of the magnificent lighting of the place were not made. The Auditorium, as a building to house large gatherings, would do amazing credit to any city in any community; location, architecture, dimension, fit-

tings (in fact, everything about it) are excellent. There are 42 different exhibitors within the enclosure. The balcony carries or supports 18 lamps (Humphrey, 2-bracket type), and from the ceiling are suspended 6 chandeliers, of the design so greatly admired in the Boston display of 1910. This Company also illuminates the entire front of the building, together with two blocks of Curtis street, the noble road leading to the Hall. The illumination of the gallery is most effectively done by the Welsbach Company by means of plentiful examples of the Intenso type of lamp, aided by several smaller unit lamps; two sides of the interior of the hall, and two sides of its exterior as well, being made bright as daylight by means of "Intensos." Another creditable share in the illumination is taken by the Sun Vapor Lighting Company, the installation of which was made on posts in Cortes street, beyond the Humphrey lines, to the corner of the Denver G. & E. Company's building. Each post carries a cluster of 5 lights. It is safe to say that, even in this "City of Lights," Denver saw much that was a triumph for gas in this specimen of illuminating exteriors and interiors of large structures. In the afternoon the ladies journeyed in autos to the glorious scenes of the foothills of the mountains, the grandeur of which will be noted by us the week end. In the evening they screamed over the clever work done by Richard Carle as "Jumping Jupiter" on the stage of the Broadway Theater. While the "weaker sex" were enjoying the play, the "stronger type" were enjoying an "Athletic Smoker," the degrees of which were worked in El Jebel Temple. Need I declare that "some stunts" were pulled. Take my word for it, 'tis even so.--W.

BROWN PALACE, Oct. 26, 1911.

Dear JOURNAL: A "paper bag demonstration" opened the proceedings to-day, the demonstratress being Ana A. Carroll, whose work was again well done. Then followed the appointment of a Committee to confer with the manufacturers over hastening the day when gas appliances of various sorts are to be "standardized." The Chairman is Mr. O. H. Fogg, of your city. He would seem to have a good bit of work on his hands. However, he is an active man. The papers for the day were these: "Manufacture of Gas Mantles from Artificial Fibers," by Mr. O. Gulbrandsen, of Gloucester, N. J.; on "Increased Efficiency in Scientific Accounting," by Mr. Paul R. Jones, of New York city; and "The Modern Gas Fixture," by Mr. C. E. Ummach, of Chicago, Ills. Now came a diversion in the shape of a "pinning bee." The initiative was the pinning on Mr. R. E. Slade of an official pin (in the lamp center was affixed a diamond). Right in sequence was the placing of a similar token on the breast of Mr. L. S. Bigelow, the pinner in this instance being Mr. Frank W. Frueauff. And thus were the pioneer President and Secretary appropriately marked. You may be sure, the amenities were accompanied by many pretty speeches. An adjournment for luncheon was next in order, so that an excellent luncheon as the guests of the Colorado Electric Club could be put away; and it was. During this interregnum, President-elect Holman ventured this prophesy as to the future meeting places: 1913, Philadelphia; 1914, St. Louis; 1915, San Francisco—listen to the latter, Messrs. Britton, Martin and Jones! The afternoon's session was brought to a close by the consideration of these papers: "Ventilation of Fuel Gas Appliances," by Mr. James H. Walker, of Milwaukee, Wis.; and the "Relative Cost and Efficiency of Gas, Electric and Gasoline Lighting," by Mr. W. M. Blinks, of Kalamazoo, Mich. Both were excellent presentations, and it is a very pleasant task to say herewith that the communication by Mr. Blinks was not only scholarly (despite the statistical nature of the subject), but that its figures (the compiling of which must have cost many a delve into past day records) will long be referred to by the many who at some time or another have to do with this subject, which appeals to the municipal ruler, the gas company and the taxpayer with cogent force. Thus ended the technical side, and we have been instructed to be not sluggards on the morrow, for every arrangement is completed for the successful taking of a trip the glories of which may not be recounted until one has experienced them in person. So here's to the Frueauff-Brady-Stannard combination again; and that fair skies may be our portion is the fervent hope of all.—W.

BRIEFLY TOLD.

INDUSTRIAL GAS APPLIANCE LABORATORY.—The Consolidated Gas Company, of New York city, has for several months been concerned in the work of fitting up an Industrial Gas Appliance Laboratory, the housing of which is in the handsome, new business structure known as the Schleicher Building, corner of Second avenue and Twenty-second street. The laboratory was publicly opened some days ago, and "commencement day" the premises were given over quite freely to the inspection of those who wished to visit it. And that the public will be welcomed thereto hereafter is fully attested by this inscription carried on the front windows:

"Industrial Gas Appliance Laboratory.
Visitors Welcome."

On entering the room one cannot fail to be impressed with the completeness and harmoniousness of the outfitting, even if the place is devoted to the displaying of machinery that finds its final resting place in obscure quarters. Likely the first thing to attract the attention of the observing visitor is a 6½-horse power Otto gas engine, and alongside is an electric motor of equal force. The overhead pulleys are so arranged that the machines can be operated either singly or together. These, as well as three heating machines and two positive blowers, are separated from the visitor by a neat railing. Of course, the layout is equipped with proper safety devices, preventing danger to either operator or visitor when the apparatus is being examined when under action. To the south side of the room a hood, 56 feet in length, and 5 feet in width is placed, and the walls below it, as well as the flooring underneath it, are painted a dull black, the better to show the color of the flames in the various machines. From this hood, running to perhaps the center thereof, is a ventilating pipe (10 inches by 12 inches) extending on the exterior of the building to a height well above the roof, the entire length being about 110 feet. Standing immediately under the hood are 20 appliances, while a number of others are connected by an independent pipe leading into the hood. Each and every appliance is connected for gas, for air (where blast is required), and for water, so that a practical demonstration can be made of any apparatus in service. The appliances are grouped as far as possible. Beginning in the southwest corner of the room, and under the hood, one finds these steam appliances: A 3-horse power, gas steam boiler; a No. 3 steam generator; and a feather steamer. Then, in regular sequence, are: A combination tool-room furnace, clay annealer, melter, round annealer, bar annealer, forge, tool-room forge, oil tempering furnace, oven furnace, tempering furnace, rivet heater, muffle furnace with D. C. motor and fan blower, lead hardening furnace with extra pot for cyanide, muffle furnace with cupelling attachment, portable melting pot, 1,000 pound, soft metal furnace with hood, wire basket and thermometer; brazing tables, automobile and wagon tire heaters, 40-gallon butchers' cauldron, 50-gallon cauldron with bottom draw-off, agitator and pump, china kiln, incinerator, oven with damper and thermometer, core-drying oven, japaning oven, aluminum water still, heating machines, positive blowers, confectioners' stoves—one with D. C. motor and blower, making in all 43 appliances standing on the floor. There are 75 bench appliances on metal tables, which, with a few suitably attached to the walls, make a total of 135 devices, all connected, ready for instant demonstration. The appliances on the tables embrace soldering furnaces and self-heating soldering irons, melting furnaces, glue heater, bench forges, rivet heaters, soft metal furnaces, and a great variety of burners, the largest being connected with D-C. motors and fan blowers, consuming about 700 cubic feet of gas per hour. A complete assortment of blowpipes and brazing burners is also in evidence. The appliances are located in sections, each section being served by a 30-light meter, with special reducing device which consists of a straight line control, the figures changing for each 10 feet, and so arranged that the counter can be turned back after each demonstration. Portable baths are also provided, one each for fresh or salt water; and for a cotton seed oil "dip," if one is so inclined. Then there is a portable sawdust dryer, and the several things last enumerated are set on casters, so that one can readily be taken to any other appliance the contiguity of which is needed for a complete demonstration. The main meter (100-light) is provided with an automatic shut-off in case of air excess. The room is being inclosed by a suitable arrangement of the Lyon metallic steel partitions, carrying mesh tops. This entire work has been brought to completion under the direct supervision of Mr. George G. Ramsdell. The Industrial Appliance Depa rtment will be connected with the General Fuel Appliance Department of the Company under the supervision of Mr. H. B. McLean, assisted by Mr. W. K. Eavenson, who is now organizing a force of solicitors. The laboratory proper is in charge of Mr. James Reynolds.

WHAT SHALL I ADVERTISE?—One of the many advantages of a well appointed showroom is the opportunity afforded to judge conditions through the demeanor and attitude of consumers. One of the simplest examples may be illustrated by means of a la[illegible] affixed with a pilot light. If a number of consumrs express surprise that gas lamps can be so easily turned on or off, you may rest assured that this field has not been successfully covered in your city. This same method applied to the numberless variety of convenient gas appliances will be a stronger motive to promote an aggressive sales' campaign than pages of statistics. Another method of obtaining information as to the extent to which various appliances are used would be to canvass all or part of your employees, to learn how many use mantle burners, pilot lights, ranges, water heaters, heaters, and the like. The manager who has all of the important modern gas conveniences will find such an inquiry surprising as well as profitable. When a gas burning appliance of merit is not in general use, the advisability of a sales'-and-advertising campaign is obvious, and if handled intelligently will produce satisfactory results.—LUMINO.

Publications.

[All Publications, Catalogues, etc., mentioned below, are kept in our office for the convenience of our patrons.]

Chain Grate Stokers.—The Laclede-Christy Clay Products Company has issued a handsome catalogue covering its "Chain Grate Stokers." The apparatus is fully illustrated and described. Those desirous of making improvements to their boiler plant equipment would undoubtedly be attracted by the simplicity of construction, which is well portrayed in most effective and pleasing manner in the Company's pamphlet.

Gas Engines.—Catalogue 27 of the Otto Gas Engine Works illustrates the general features of the types of gas engines manufactured by this Company.

(*Continued from page 279.*)

tools and implements, seem to prove that coal was mined in Britain before the Saxon Invasion.

"Fossil fuel" was known to the Chinese from remote antiquity, and it may have been due to their knowledge of the use of coal that the Chinese were able to discover and manufacture porcelain, gunpowder, paper and the mariner's compass long before the rest of the world.

The earliest mention of coal is contained in a treatise on "Stones," written about 238 B. C., by the Greek philosopher Theophrastus, a pupil of Plato and the successor of Aristotle as President of the Lyceum at Athens. Regarding coal he wrote:

"They call those fossil substances anthracite, and when broken up for use they are of an earthy character; nevertheless, they inflame and burn even like charcoal. These are found in Liguria and Elis, in the way of Olympias, over the mountains, and are used by the smiths."

The Saxon chronicle of the Abbey of Petersborough, England, contains an entry regarding coal, as follows:

"About this time (852 A.D.) the Abbot Ceolred let the land of Sempringham to Wulfred, who was to send each year to the monastery 60 loads of wood, 12 loads of coal, 6 loads of peat, 2 tuns of fine ale, 2 neats' carcases, 600 loaves and 10 kilderkin of Welsh ale; 1 horse also each year, and 30 shillings, and 1 night's entertainment."

Introduction of Coal.—Although well known in England, coal apparently was not used much before the 9th century, A.D., when it was found to be a good substitute for charcoal. It was first mined systematically in the year 1180, and became a commercial commodity about the time of the Magna Charta, in 1215. From old English records we learn that, in the year 1259, King Henry III. granted a charter to the freemen of Newcastle to "dig for cole," and at that time "sea cole" began to be used in London, both for domestic and manufacturing purposes. During the reign of Edward I. (1272-1307) the age of the Feudal Barons passed, and modern constitutional England was born. The first representative Parliament assembled at Westminster, in 1295, and about that time a Royal Proclamation was issued forbidding the use of coal in London on account of the "noisome smell and thick air." It polluted the atmosphere and produced a black fog, and "Justices were empowered to impose fines on those persisting in its use."

Notwithstanding all opposition, coal gradually replaced wood and charcoal, being extensively used by brewers and others. In the reign of Queen Elizabeth (1558-1603) its use was prohibited while Parliament was in session, because "the health of the Knights of the shires might suffer during their abode in the Metropolis." It was during this period that some of the most interesting events of English history occurred. In 1576 the first public theater was built in Blackfriars. Sir Francis Drake made the first trip around the world (1577-1580). The Spanish Armada sailed for England, July 12th, 1588, and was destroyed by Drake and Howard, July 28th and 29th. This was the Golden Age of Literature, when the world received the immortal works of Spenser, Lyly, Marlowe, Shakespeare, Johnson and Bacon.

The use of coal stimulated all kinds of manufacturing. The iron works of Kent and Sussex, threatened with extinction by the growing scarcity of wood, were saved by coal, and the exportation of tin and copper from Cornwall was commenced. Coal mining gradually spread to Durham, Yorkshire, Lancashire, Midland and South Wales. In the year 1661 John Evelyn, the English diarist and treasurer of the Greenwich Hospital, wrote regarding the coal fires:

"The pernicious smoke sullies all the air, superinducing a sooty crust and furr upon all that it lights, spoiling movables, tarnishing the plate, gildings and furniture, and corroding the very iron bars and hardest stones with those piercing and acrimonious spirits which accompany its sulphur, and executing more in 1 year than the pure air of the country could effect in some hundreds."

The use of coal became so general that, about 1662, the sum of £200,000 per annum was raised by King Charles, II., by means of a "Hearth Tax" imposed on every fireplace in England.

In the 17th century coal was exported to France, Belgium, Holland and Germany, and, during the 18th century, the development of the industry was almost incredible. Iron was becoming the working material of the world, and the mechanic arts, newly risen from the industrial chaos of the dark ages, were making ever increasing demands for heat and power.

In 1764 the weaver, Hargreaves, invented the spinning jenny, relieving mankind from the most intolerable drudgery, for which he was mobbed by his fellows in 1768. The spinning machine was invented by Arkwright, the barber, in 1768, and he also was attacked by mobs and his shop destroyed. The invention of the spinning mule (1779) by Samuel Crompton, together with the machines of Arkwright and Hargreaves, created the immense textile fabric industry of Great Britain. Three hundred years before this time (1476) William Caxton had introduced the printing press into England from Bruges, and when (1765) James Watt made his steam "fire engine" he forged the last link in a chain of circumstances that saved England during her terrible struggle with France and Napoleon, and made her the wealthiest and greatest manufacturing country in the world.

In 1807 Fulton's "Clermont" steamed from New York to Albany, which was the beginning of successful steam navigation. George Stephenson ran his first locomotive at Killingworth Colliery, in 1814, and in 1829 his "Rocket" travelled from Manchester to Liverpool, at times developing the unheard of speed of 32 miles an hour. Later developments in steam engineering and other coal consuming industries readily explain the demand that, in the year 1905, required an output from England's mines of 230 million tons of coal.

The Development of Chemistry.—After he had discovered petroleum, natural gas and coal, man still lacked the knowledgo of chemistry necessary to enable him to utilize the rich stores unfolded at his very feet. Before the 16th century there was no idea of the science of chemistry as we understand it now. In a Greek lexicon, published sometime before the 11th century, Suidas defined chemistry as "the artificial preparation of gold and silver;" in fact chemistry was known at that time as "alchemy," and, during the Middle Ages, the transmutation of base metals into gold and silver was the goal toward which all chemical experiments were directed.

Some time during the 14th or 15th century, an illusive character, known as Basil Valentine, emerged from the fog of error and superstition surrounding the scientific knowledge of his time. An investigation by the German Emperor, Maximilian 1., in 1502, developed the fact that he was a Benedictine monk, of South Germany; but his real name was not revealed. He discovered muriatic, sulphuric and nitric acids, and may be considered the founder of the science of chemistry as opposed to "magic" and "alchemy."

In the year 1541, Paracelsus, a Swiss naturalist, appeared in the city of Salsburg and attained great renown as a physician and chemist. He was first to disregard the superstitions and childish notions of the Middle Ages, and learn directly from his observation of nature. He discovered hydrogen gas (which he produced by dissolving iron with sulphuric acid), and advanced the theory that all vital processes are chemical. His plan of intelligent observation was followed by Von Helmont (1577-1644), who distinguished between fixed gases and vapors, and developed chemical science by introducing experimental analysis. In 1609 Von Helmont settled in Brussels, and, while experimenting with sulphuric acid, observed that, by its action on various substances, an inflammable, aeriform body was produced that differed entirely from atmospheric air. This "spirit," he noted, could be produced also by fermentation and by combustion. In one experiment he burned 62 pounds of charcoal, and, obtaining a residue of only 1 pound of ash, and concluded that the spirit was composed of 61 pounds of matter that had disappeared. In his "Treatise de Flatibus" Von Helmont observes:

"This spirit, up to the present time unknown, not susceptible of being confined in (open) vessels, nor capable of being reduced to a visible body, I call by the new name 'Gaz.'"

The word was probably derived from the German word "Geist," meaning "Spirit."

Following Von Helmont, the Hon. Robert Boyle made a particular study of air and gases, and to him we are indebted for our first certain knowledge of the absorption of air in calcination and in combustion. In his "New Experiments," published in 1662, he enunciated the statement, known as "Boyle's Law," that volume and pressure are inversely proportional. This was confirmed by the French scientist, Mariotte, in 1676. Boyle repeated Paracelsus' experiment with sulphuric acid and iron, and seems to have been first to discover that the hydrogen gas thus produced was inflammable. Boyle was one of the founders of the British Royal Society, which was formed in 1645, and regularly constituted in 1660.

The word "Gaz" was apparently forgotten, or at least was not used for more than a century after Von Helmont's time, "inflammable air" and "fixed air" being the terms generally adopted. In a chemical dictionary, published by Macquer in 1771, the word

"gas" reappears and is defined as "A name given by chemists to invisible parts which escape from certain bodies."

During the 100 years following Boyle's death (1691) the science of chemistry, and particularly of gas lighting, advanced with gigantic strides. About 1720 Dr. Stephen Hales, the English philosopher and inventor, made a series of exhaustive experiments to determine the amount of air that could be secured from various substances by distillation. Among these was coal, and he discovered many properties of coal gas, although he did not notice particularly its value as an illuminant. From 1727 to 1748 he published several accounts of his experiments for which, with his communications to the Royal Society, he was awarded the Copley Medal. In 1754 Joseph Black, a Scotch chemist, discovered carbonic acid gas (carbon dioxide) and in 1760 propounded the theory of specific heat and of latent heat. Oxygen was discovered (1774) by Joseph Priestly, in England, and by Carl Scheele, in Sweden.

At this period two of the most important mechanical elements of the modern gas plant were invented, namely: The water lute, by Priestly, and the gasholder, by Lavoisier. The applications of the water lute (water seal) are innumerable in every works; *e. g.*, it is used in drips, purifiers, holders, and hydraulic valves; the hydraulic main, devised by Clegg in 1812, is a direct application of this idea.

A description of Lavoisier's gasholder was first published in England in 1789, although it was invented in 1781. The composition of atmospheric air was also discovered by Lavoisier in 1775, and (1784) Henry Cavendish found that water was composed of the hydrogen of Paracelsus and the oxygen of Priestly. It is a remarkable fact that oxygen, which composes one-fifth of our atmosphere, and in various combinations one-half of the earth's crust, has been known only for about 140 years.

The scientific principles of combustion were discovered during the 30 years, from 1754 to 1784, by Black, Priestly, Lavoisier and Cavendish. This disposed of the hypothetical "Phlogiston" theory of Stahls, which up to that time had been generally accepted. During their lives the discoveries of these great men were little appreciated; in fact their labors were wholly misunderstood, and instead of honor, their reward was persecution and even death. In 1766 Lavoisier, at the age of 23, won a gold medal offered by the French Academy of Sciences as a prize for the best essay on the subject of "Street Lighting." Although a member of the Academy, he fell under suspicion during the reign of terror and perished by the guillotine at the height of his intellectual activity in May, 1794. In 1791 Priestly was mobbed at his home in Birmingham, his instruments destroyed and his house burned. He went to London, but in 1794 was forced to flee to America, where he settled in Pennsylvania, and died in Northumberland in 1804.

(To be Continued.)

The Gas, Electric and Railway Association of Oklahoma.

At a meeting of parties interested, called by Prof. Harold V. Bozell, Director of the School of Electrical Engineering, University of Oklahoma, held the 6th inst., a Gas, Electric and Railway Association was formed, with the following officers:

President.—Mr. Noel R. Gascho, Manager of the Alva Light and Power Company.

Vice-President.—Mr. Fred. W. Caldwell, Manager of the Shawnee Gas and Electric Company.

Secretary-Treasurer.—Prof. Harold V. Bozell, Norman.

Directors.—Messrs. Galen Crow, Manager, Guthrie Light and Power Company, and Paul M. Galloway, Manager, Tulsa Gas and Electric Company, each for 1 year; V. H. Francis, Manager, Kingfisher Municipal Electric Light and Water Plant, and L. A. Pritchett, Manager, Marlow Municipal Electric Light Plant, for 2 years.

During the sitting of the committee appointed to make recommendations as to the scope of the organization, and to present a constitution and accompanying by-laws, there was a general discussion regarding the defects of the Public Utilities Association and the benefits from the proposed organization to be derived by both privately owned and municipally controlled plants. During its existence the public of the State seemed to have an idea that the former Society was some sort of political organization, or at least an organization to fight the laws and commissions, etc., which came into being at the time of Statehood. The central stations had to overcome great difficulties at the time, on account of the numerous regulations to which they had to conform at once, and when the managers got together in the old association to talk over these matters they were unhappily reported as combining against the public. Mr. V. H. Francis, of the Kingfisher municipal plant, showed very clearly how the proposed association could help the municipal plants, and explained some of the troubles that the municipal manager has that the private manager knows nothing of. The question as to how the State organizations might be able to reach the commissioners and councilmen of different cities where municipal ownership was discussed, and the sentiment of the municipal managers present seemed to be that, in times of disagreement with superiors over matters of engineering facts and proper management, they would be helped very much by the fact that their views would often be backed by acts of the association which would have much weight with the city fathers. The topic of the good the society would be able to do in the way of prevention of "fool legislation" with the enactment of good legislation was brought up by Prof. Bozell, who cited instances of legislation in neighboring States which, if enacted, would have caused some sorts of business to be a joke. The point was brought out that this influence on legislation would be—and could exist in no other way—only the furnishing of facts to the legislators concerning the effects certain proposed laws would have if enacted, and that the association would countenance no one bringing influence to bear to have legislation "favorable to interests" enacted. The purpose of the association would be the promotion of the interests of the members along social and scientific lines, and to help, in case laws were proposed in which the association was interested, see that these laws were based on facts.

The constitution and by-laws adopted, provide for three classes of members; namely, A, B and associates. The first is open to managers and directors of companies; the second to other employees of the same; the third to any one interested in the gas, electric or railway business or skilled therein, including the commercial men. Only the first-class members may hold office and vote. There is provision for advancement from Class B and associate membership to membership in Class A. An annual meeting is provided for.

There was present during the meeting—which was called in the Auditorium, State Fair Grounds, Oklahoma City—a very good representation of managers of plants from all over the State, municipal as as well as private interests being represented. Almost all of the large towns of the State were represented, and all of the commercial men in that part of the country who knew of the meeting were present. The annual meetings will be held alternately on the east and west sides of the State—that is, one meeting will be held in what was Indian Territory, the next in what was the Territory of Oklahoma.

Following the election of officers the new President delivered an address under the title "Co-operation, Not Combination," which he said should be the object of the organization. He claimed that as the regulation of public utilities has come to stay, it is to the advantage of all parties that the regulated companies co-operate with the corporation commission. Co-operation should not only exist between the association and the commission, but member-companies and individuals should lend the commission every assistance possible in ascertaining the facts relating to the business. The commission is the same as a court of justice, being as much the court of the defendant as of the plaintiff; it is just as much the commission of the public utilities as it is of the public. It was not created to work hardships on any class or any line of business, but to see that all parties concerned were treated fairly. As long as men of high standing and with honesty of purpose were elected to these positions neither the public nor the public utility companies had anything to fear.

It was common knowledge among the member-companies that certain plants operated by municipalities which cannot pay ordinary operating expenses give lower rates than do privately owned plants elsewhere furnishing similar service. Customers of the latter plants hearing of the lower rates, wonder why a private company could not furnish the service at as low a rate as a municipality. They kept talking this over among themselves, aided by the demagogue politician, until they worked up a fearful case of robbery and graft. They were prejudiced, and the privately owned plant might sell service at actual cost, or below cost for that matter, yet in their minds the graft would still exist. That state of affairs should be gone into by the commission so the municipalities should be shown where they were operating at a loss and be required to bring the rates up where they belonged so as to pay expenses, interest on the bonds, provide for depreciation, etc. The municipalities engaged in furnishing lighting service to their inhabitants should be required to keep their accounts and make reports in detail to the commissions as to income,

expenses and earnings, just as was done with privately owned companies. The majority of the municipal plants would be glad of this sort of help from the commission. They would like to be placed on a paying basis, so that when a machine was burned out, transformers lost by lightning, or the interest on their bonds was due, they would not have to borrow from some other city funds or vote more bonds to meet these items.

By proper co-operation adverse legislation only can be prevented, and at the same time legislation of a just and necessary character enacted, such as giving the commission power to issue "indeterminate permits" during satisfactory service and empowering it to decide whether a community can best be served by two public utility companies in competition or by one under State regulation—further, before a competitive utility could build another plant in the same community, it must secure a permit. Thus the commission was protective as well as regulatory.

Preliminary Report on Petroleum Refining for 1909, United States Census Bureau.

Last Wednesday the Department of Commerce and Labor (Bureau of the Census) issued the following statement:

A preliminary statement of the general results of the Thirteenth Census of establishments engaged in the refining of petroleum was issued by Census Director Durand. It includes a summary, comparing the general figures for 1904 and 1909, and a statement of the quantity of crude petroleum used; also the quantity of the principal products obtained therefrom. It was prepared under the direction of William M. Steuart, chief statistician for manufactures, Bureau of the Census. The figures are subject to such revision as may be necessary after a further examination of the original reports.

The word "establishment," as used in the Thirteenth Census, is defined as meaning one or more factories, mills, or plants owned, controlled, or operated by a person, partnership, corporation, or other owner located in the same town or city and for which one set of books of accounts is kept.

The reports were taken for the calendar year ending December 31, 1909, wherever the system of bookkeeping permitted figures for that period to be secured; but in case the fiscal year of an establishment differed from the calendar year, a report of its operations was obtained for the fiscal period falling most largely within 1909.

The Rates of Increase.—The summary shows increases in all the items at the census of of 1909 as compared with that for 1904, except for average number of wage earners and their wages. The capital invested increased 33 per cent.; the gross value of products, 35 per cent.; cost of materials, 43 per cent.; value added by manufacture, 6 per cent.; number of salaried officials and clerks, 35 per cent.; amount paid in salaries, 44 per cent.; miscellaneous expenses, 78 per cent.; primary horse power, 96 per cent.

There were 147 manufacturing establishments in 1909 and 98 in 1904, an increase of 49 or 50 per cent.

The capital invested as reported in 1909 was $181,916,000, a gain of $45,635,000, or 33 per cent. over $136,281,000 in 1904. The average capital per establishment was approximately $1,237,000 in 1909 and $1,391,000 in 1904. In this connection it should be stated that in the census schedule the inquiry concerning capital invested calls for the total amount both owned and borrowed and invested in the business, but does not include the value of rented property, plant, or equipment which was employed in the conduct of manufacturing enterprises. In the final bulletins and reports there will be a separate statement of the rental paid for such property.

Value of Products.—The value of products was $236,998,000 in 1909 and $175,005,000 in 1904, an increase of $61,993,000, or 35 per cent. The average per establishment was approximately $1,612,000 in 1909 and $1,786,000 in 1904. The value of products represents the product as actually turned out by the factories during the census year and does not necessarily have any relation to the amount of sales for that year.

Cost of Materials Used.—The cost of materials used was $199,273,000 in 1909, as against $139,387,000 in 1004, an increase of $59,886,000, or 43 per cent. The average cost of materials per establishment was approximately $1,356,000 in 1909 and $1,422,000 in 1904. In addition to the component materials which enter into the products of the establishment for the census year there are included fuel, rent of power and heat, and mill supplies. The cost of materials, however, does not include unused materials and supplies bought either for speculation or for use during a subsequent period.

Value Added by Manufacture.—The value added by manufacture was $37,725,000 in 1909 and $35,618,000 in 1904, an increase of $2,107,000, or 6 per cent. This item formed 16 per cent. of the total value of products in 1909 and 20 per cent. in 1904. The value added by manufacture represents the difference between the cost of materials used and the value of products after the manufacturing processes have been expended upon them.

The miscellaneous expenses amounted to $9,445,000 in 1909 and $5,298,000 in 1904, and increase of $4,147,000, or 78 per cent. The average per establishment was approximately $64,000 in 1909 and $54,000 in 1904. Miscellaneous expenses include rent of factory or works, taxes, and amount paid for contract work, and these items, as well as such office and other expenses as can not be elsewhere classified, will appear separately in the final reports.

The salaries and wages amounted to $13,759,000 in 1909 and $12,713,000 in 1004, an increase of $1,046,000, or 8 per cent. The number of salaried officials and clerks was 2,669 in 1909 and 1,974 in 1904, an increase of 695, or 35 per cent. The average number of wage earners employed during the year was 13,929 in 1909 and 16,770 in 1904, a decrease of 2,841, or 17 per cent.

The amount paid in wages decreased 2 per cent. The decrease in number of wage earners and total wages is due to the fact that some of the largest refineries made separate reports in 1909 for their box, cooperage and tinware shops, and the statistics for them have been included by the census as a part of these various industries. At the census of 1904 these operations were included in the report for the refineries. The primary horse power was 90,268 in 1909, and 46,019 in 1904, an increase of 44,249, or 96 per cent. The average horse power per establishment, considering all establishments, was approximately 614-horse power in 1909 and 470 in 1904.

Quantity of Crude Oil and of Principal Products.—The number of 42-gallon barrels of crude petroleum used, as reported in 1909, was 120,775,439, and in 1904, 66,982,862, an increase of 53,792,577 barrels, or 80 per cent. The kinds of crude oil used in 1909 were distributed in very different proportions from those in 1904. This change has materially affected the relative quantities of the various products.

The number of 50-gallon barrels of illuminating oils produced was 38,468,494 in 1909, and 27,135,094 in 1904, an increase of 11,333,400 barrels, or 42 per cent.; of fuel oils, 34,034,577 in 1909, and 7,209,428 in 1904, an increase of 26,825,149 barrels, or 372 per cent.; of lubricating oils, 10,745,885 in 1909, and 6,298,251 in 1904, an increase of 4,447,634 barrels, or 71 per cent.; of lubricating and other greases, 138,302 in 1909, and 202,439 in 1904, a decrease of 64,137 barrels, or 32 per cent.; of naphtha and gasoline, 11,903,159 in 1909, and 5,811,289 in 1904, an increase of 6,091,870 barrels, or 105 per cent.; and of paraffine wax, 946,830 in 1909, and 794,068 in 1904, an increase of 152,762 barrels, or 19 per cent.

Comparative summaries follow, giving the general statistics for the industry, the quantity of crude petroleum used and the quantity of the principal products, 1904 and 1909:

Petroleum Refining—General Summary: 1900 *and* 1904.

	Census. 1909.	Census. 1904.	Per Cent. of Increase, 1904 to 1909.
Number of establishments	147	98	50
Capital	$181,916,000	$136,281,000	33
Cost of materials used	199,273,000	139,387,000	43
Salaries and wages	13,759,000	12,713,000	8
Salaries	3,920,000	2,724,000	44
Wages	9,830,000	9,989,000	12
Miscellaneous expenses	9,445,000	5,298,000	78
Value of products	236,998,000	175,005,000	35
Value added by manufacture (products less cost of materials)	37,725,000	35,618,000	6
Employees:			
Number of salaried officials and clerks	2,669	1,974	35
Average number of wage earners employed during the year	13,929	16,770	*17
Primary horse power	90,268	46,019	96

* Decrease.

Petroleum Refining - Quantity of Crude Petroleum Used, and of Principal Products: 1909 *and* 1904.

		Census. 1909.	Census. 1904.	Per Cent. of Increase, 1904 to 1909.
Total quantity of crude petroleum used (barrels of 42 gallons)		120,775,439	66,982,862	80
Principal Products:				
Illuminating oils	Quantities (barrels of 50 gallons)	38,468,494	27,135,094	42
Fuel oils		34,034,577	7,209,428	372
Lubricating oils		10,745,885	6,298,251	71
Greases (lubricating, etc.)		138,302	202,439	*32
Naphtha and gasoline		11,903,159	5,811,289	105
Paraffine wax		946,830	794,068	19

* Decrease.

Special English Correspondence.

COMMUNICATED BY NORTON H. HUMPHRYS.

SALISBURY, ENGLAND, October 10, 1911.

Publicity.—Paper Bag Cookery.—Technical Education in France.

The publicity movement has now crystallized into definite shape, and a meeting is to be held in London this week for the purpose of giving it a send off. It is proposed to add to the already not inconsiderable number of associations connected with our industry, by the formation of a "British Commercial Gas Association," established under the auspices of the Institution of Gas Engineers. The attendance at the meeting is not to be confined to representatives of contributing gas undertakings, but is also open to non-contributors who are interested in the movement, and the President of the Institution, Mr. R. G. Shadbolt, invites perusal of the draft setting forth the proposed constitution, rules and methods of operating, and any observations or criticism to be forwarded to him beforehand. Opponents of the scheme, if any exist, are thus challenged to declare their objections or else for ever after to hold their peace. The scheme appears to have been completely threshed out in Committee, so far as can be judged by a perusal of the same, and probably any exceptions to it that may be raised at the meeting have already been foreseen and provided for.

The drain on the energies of the Institution President for the time being, is becoming so onerous that one wonders how things are kept going in his home sphere of labor, during his term of office, while he is travelling about to all corners of the British Isles to attend meetings of the District Associations. Mr. Shadbolt must have spent no inconsiderable portion of his waking, if not sleeping hours, in advocating the publicity scheme, and his immediate predecessors did the same in regard to commercial sections. Evidently a good right hand man in the form of a qualified assistant at home must be indispensable, and with the continual increase of detail that is falling to the lot of the President, we are getting within measurable distance of requiring an entire time officer. Many members of the Institution, otherwise well qualified, would be compelled to decline the honors of the Presidential chair for the simple reason that they could not spare the time. To give an example, only the week before last Mr. Shadbolt attended a meeting of the South Wales District Association at Merthyr Tydvil on the Wednesday, and turned up at the Eastern Counties meeting at Felixstowe—some 300 miles distant—on the Friday. As *ex-officio* member of several committees there is a continual demand for his presence in London.

While the new Association is to be to some extent subject to the control of the Institution, there is every provision for a separate and independent existence. The acting members will be representatives of subscribing undertakings. It is understood that the sinews of war are to be provided, not by annual subscriptions, but by a levy of 2s. 6d. per million cubic feet of gas sold per annum. A concern doing 100 millons will pay £12 10s., and one doing 1,000, £125 per annum, and each subscribing undertaking will have the right of nominating 2 to 12 ordinary members according to the amount of its contribution. Each subscriber may also nominate as associate members the whole or any portion of its commercial staff. The President of the Institution for the time being is also to be President of the Commercial Association, and the members of the Council for the time being are also *ex-officio* members of Committees, but apart from that the affairs will be under the control of the ordinary members. Amongst the chief objects to be attained, is the promotion of the commercial prosperity of the industry by co-operate action, to adopt such means of making known the advantages to be secured by the use of gas as may be expedient, particularly by means of advertisements, circulars and printed matter, to organize exhibitions, lectures or demonstrations, calculated to promote the prosperity of the industry, to facilitate interchange of information and ideas, to develop and improve the commercial methods of those engaged in the industry, and to purchase, reproduce, print, publish or distribute any printed matter relating to the industry.

Attention is also devoted to the securing of even representation in Committee from all parts of the area covered by subscribers. It is proposed to divide the whole of the British Isles into 9 districts, each one to constitute to some extent a sectional division, and each district will have the right to nominate members of Committee, one for every £500 represented in annual subscription. This arrangement will afford means for dealing with matters of a local nature that are not of interest except to parties in the particular area. Every gas manager knows that he has to deal with characteristic local habits or customs, and possibly special local hindrances. Sometimes popular prejudice or ignorance is a thing to be reckoned with. To take an example, in one district accidents with cooking stoves are unknown. In another oven explosions, due to carelessness with the taps, occur with sufficient frequency to prejudice the use of the apparatus. Some people take naturally to the maintenance of incandescent burners. I know a gentleman, now approaching 80 years of age, who makes a hobby of attending to every mantle throughout his large house. He is a life long non-abstainer, and points with pride to the fact that he never breaks a mantle and that he secures an unusually long life for them. Apparently puerile matters of this nature are not to be despised as they may have a very important effect on the business.

These are a few of the main features, but the whole detail appears to have been matured and the Council are evidently prepared to start at once. If the scheme is not a success, the failure will be due to lack of adequate support, and not to lack of care or skill on the part of the promoters. But it is rumored that sufficient support is already forthcoming, and probably any non-contributor who is rash enough to venture up to the meeting will be roused to a sense of the error of his ways.

It is to be hoped that the Association will not follow the general lead of modern advertising, which tends towards the sacrifice of truth, dignity, and even ordinary honesty, to the desire to catch the public eye. There appears to be a general impression that caricature, broad farcical humor, and cheap Joe Millerisms, are the things to win the public custom. Considerable caution is necessary, also, in reference to other competitors in the heating and lighting business, because any mention, however uncomplimentary, is more or less of an indirect advertisement. The mere fact of referring to a competitor is in itself a confession that the system aimed at has secured sufficient following to make it worthy of notice. And it is always possible to prepare a more or less feasible reply. Provision merchants, for example, do not advertise the doubtful qualities of goods sold by neighbors, in the same line of business, and the Association will do well to keep clear of such discreditable tactics, and confine themselves to information about their own wares. Various enterprises have, from time to time, been promoted for the purpose of educating the consumer, and without exception the results have been satisfactory, and there is no reason why the publicity movement should not be a success.

Considerable public attention has been directed to the system of "paper bag" cookery, and it has been suggested that the same may well be advocated by gas companies as a means of increasing the usefulness of gas stoves. But there is really no more connection between the consumption of gas and the use of a paper bag, than with the size or shape of the pot or kettle used, and gas companies will do well not to entrench on the province of the professional cook. The system simply consists of fastening up the articles to be cooked in an envelope of greased paper, so that they literally stew in their own juice, and the result is claimed to give better results as regards the nature of the food cooked, at a reduced cost for fuel. In localities where the cost of gas is a hindrance to its general use in the kitchen, the subject might be considered as an indirect medium for extending sales. But such a course is not necessary where, as in most towns in this country, the number of cookers on hire extended to two-thirds of the total number of consumers. The system has been used for years in various parts of the continent where fuel is expensive, and it would appear to be equally adaptable to any form of cooking apparatus. "Paper bag" demonstrations are being given in our principal towns, but I do not regard the system as more than a passing hobby. It does not commend itself to the kind of cooking adopted by the average user of a gas cooker in England.

The French Association of Gas Managers has been inquiring into the subject of technical education, and comparing the position in France with that in other countries. After a full investigation they have arrived at the conclusion that the question is more advanced abroad than at home, and that this backwardness should be overcome as soon as possible. But the subject of higher training does not present itself to the Association in the same way as it does abroad, because the great French engineering schools or colleges give to their students a technical education of a general character, which enables them on leaving the schools to specialize very quickly in any branch of industry. As regards foremen of gas works, the general primary training given in France, together with the numerous free courses that are established in nearly every town, puts them in a more favor

able position than that abroad. To improve the present state of affairs, both as regards the governing staff, and the foremen or head workmen, the Commission appointed by the Association has investigated the situation, and recommends methods of effecting this improvement that are different from those adopted in other countries. France has for a long time aimed at giving to all classes of the social scale the most thorough general education possible, and entering on specialization only after the individual has had his intelligence opened up by general training, and is familiar with methods of work and study that are common to all branches of industrial activity. The Commission regret that attempts have been made to lower the level of this general training, which constitutes the glory and the strength of French engineers, and hope the Association will resist such efforts without reservation. Abroad specialization is undertaken at the beginning of training, but from the point of view of simple results the Commission consider the home method the best, as shown by the work carried on by Frenchmen in all parts of the world. As the result of these considerations the Commission have drawn up a scheme of work, including instruction to be given to engineers leaving the large French schools, to enable them quickly to render effective service on entering the gas industry, the organization of the training to supply the industry with heads of outside departments, organization of technical training for foremen, and for providing good plumbers. The Commission invite the interest and assistance of members of the Association, and solicit any information or ideas on the subject. They ask them to contribute to the quickest possible advancement of the study of the question, with a view to the rapid obtaining of practical results.

Recent Patent Issues.

Prepared for the AMERICAN GAS LIGHT JOURNAL by ROYAL E. BURNHAM, solicitor of patents and counselor in patent causes, 833 Bond Building, Washington, D. C., from whom illustrations and specifications of any patent mentioned below may be obtained for 10 cents.

1,005,819. Gas Cleaning Apparatus. O. H. Ensign, Madison, Wis.

1,005,832. Charging Means for Gas Producers. N. H. Henderson, Vernon, N. Y., assignor to Syracuse Industrial Gas Company, same place.

1,005,839. Combined Gas and Water Meter Tester. W. B. Hoyt, Darien, Conn., assignor of one-half to G. E. Crawford, Bridgeport, Conn.

1,005,930. Bunsen Gas Heating Burner. J. Borderel, Paris, France.

1,006,023. Gas Burner. H. Sussmann, Berlin, Germany, assignor to Deutsche Gasgluhlicht Aktiengesellschaft (Auergesellschaft), same place.

1,006,085. Incandescent Burner. C. K. Harding, Chicago, Ills.

1,006,324. Gas Burner. H. C. Werner, Wheeling, W. Va.

1,006,396. Meter Hanger. P. Mueller and A. C. Schuermann, Decatur, Ills., assignors to H. Mueller Manufacturing Company, same place.

1,006,397. Meter Hanger. P. Mueller and A. C. Schuermann, Decatur, Ills., assignor to H. Mueller Manufacturing Company, same place.

1,006,398. Meter Hanger. P. Mueller and A. C. Schuermann, Decatur, Ills., assignor to H. Mueller Manufacturing Company, same place.

1,006,442. Incandescent Gas Burner. H. Darwin, deceased, formerly of Birmingham, England; K. Darwin, administratrix.

Items of Interest
FROM VARIOUS LOCALITIES.

MR. C. A. AVANT, Claim Attorney for the Birmingham (Ala.) Railway, Light and Power Company, was elected First Vice-President of the American Railway Claim Agents' Association, at the meeting of the named body, which meeting was held concurrently with that of the Street Railways' Association, which was brought off in Atlantic City, N. J., about a fortnight ago.

"B.," WRITING from Fitchburg, Mass., the afternoon of the 20th inst., says: "The Hudson Marlboro (Mass.) Gas Company has just completed an 8-mile stretch of 4-inch, high pressure service line between Hudson and Maynard. The pressure carried is equal to 20 pounds. That the line ran to fruitful territory seems assured from the fact that over 400 consumers have been hooked up and that the end of the applications is not yet. Mr. Edmund Cathels, formerly of the engineering staff of the Providence (R. I.) Gas Company, is the man-in-charge, and he declares there will be no let up in the Marlboro-Hudson-Maynard campaign for business until all have been put on the lines."

"M. B. R.," writing from Wilmington, Del., under recent date, says: "The last session of the Gas Study Club, of the Wilmington Gas Company, was given over to a social entertainment, consisting of a prize euchre contest followed by an informal dance—in fact the euchre and the dance were carried out without any great degree of separating. Three prizes were awarded, and refreshments were served. The scene of the feast festivities was in Pythian Castle, the music was furnished by Robinson's orchestra, and the Committee in charge was headed by Mr. E. A. Griffifth. Mr. Martin Powers was Floor Manager.

JOHN H. BINDERNAGEL, a machinist living on Lake avenue, Bloomfield, N. J., dug a tunnel from his home to the main of the Public Service Gas Company running through Lake avenue. Equipped with a drill and a piece of service pipe he crawled through the tunnel and tapped the main. Before he could insert the service the outrushing gas rendered him unconscious. He must have been exposed to the flow for at least 20 minutes. At any rate his wife on summoning him to breakfast and receiving no response, went to where he had been working. His feet were protruding from the borehole, and, finding herself unable to extricate him, shouted for help. Quick response to her appeal was made, Bindernagel was pulled out and manipulation to revive him proved he was dead. This is, we believe, the first actually authenticated case of a man losing his life while attempting to make a surreptitious gas connection.

THE Southern Counties Gas Company, of California, as to its Monrovia district, has started a campaign, the ultimate object being the acquiring of 1,000 consumers. The pledge is given that when the named number of consumers show on the books. the rate will be put at $1.25 per 1,000 cubic feet. The ruling rate is $1.35, and the consumers number something over 850.

THE Southern Counties Gas Company's headquarters are in Los Angeles—it supplies gas in Whittier, Covina, Glendora, Orange, Santa Ana, Duarte, El Monte, Sierra Madre, Monrovia, Fullerton, Azusa and Arcadia, under high pressure delivery—and the scene of its annual meeting, about mid-October. Mr. E. B. Hinsdale was elected President, succeeding Mr. S. S. Forney. Mr. Hinsdale was formerly in the banking business in Portland, Ore., but has resided in Los Angeles since his retirement. Mr. F. R. Bain was elected Vice-President and General Manager of the corporation.

THE Houston (Tex.) Gas Light Company was organized in 1866, and the gas rate was $10 per 1,000. On March 1st the net rate (now $1.10) will be $1 per 1,000.

MR. M. W. DURELL, Manager of the Spencer and Worcester County (Mass.) Gas Company, has successfully arranged the preliminaries connected with a main extension to the outlying settlement of East Brookfield. The line will be 3 miles in length, and it will feed a quite closely populated territory.

THE Eastern Light and Fuel Company, of Philadelphia, is comfortably fixed in its new suite of offices (1304-5-6) Real Estate Trust Building, that city.

"B. V. M.," writing from Indianapolis, Ind., under date of the 25th inst., says: "Perhaps it will be news to you that the reorganization of the artificial lighting supply of Vincennes, Ind., was completed when the old Vincennes Light and Power Company was taken over by the Vincennes Gas Company, by which name the succeeding corporation is to be known. The meeting at which this change was made was held in Chicago something like a fortnight ago. Mr. Jos. L. Bayard, Jr., was chosen Manager. This result means the fruition of quite some hard work, including the dissolution of a receivership, the forfeiting of the agreement with the Black Hawk Light, Power and Heat Company, and the satisfaction of a judgment held by Mr. Melvin R. Bissell, of Grand Rapids, Mich. Messrs. James Wade Emison and C. B. Schaeffer are largely interested in the new corporation, which will be a successful concern right from the start."

AT a meeting of the Directors of the Hagerstown (Md.) Light and Heat Company, held some days ago, it was decided to establish a new

schedule of selling rates, to become effective December 1, 1911—it is conditioned that, if bills are not paid on or before the 15th day of the month in which they are presented, that the old rate will obtain. The gradings are:

Quantity per Month. Cubic Feet.	Net Rate per 1,000.
1,000 to 5,000	$1.25
5,000 to 10,000	1.10
10,000 to 25,000	1.00
25,000 to 50,000	0.90
50,000 to 100,000	0.85
100,000 and up	0.80

The Directors also declared a quarterly dividend of 1¼ per cent. The report of the Superintendent showed that the recent changes in respect of distribution matters had resulted in a great decrease in the number of complaints made.

MR. ARTHUR V. WAINWRIGHT, formerly of Manasquan, N. J., is finding plenty of happenings to keep him busy in his new field of work as Manager of the Central New York Gas and Electric Company.

THE Cohoes (N. Y.) Gas Light Company has applied to the Public Service Commission of the Second District for sanction to increase its capital in the amount of $143,194, on the plea that improvements and extensions to its system have necessitated an expenditure out of earnings equal to the sum named.

THE projectors of the Citizens Gas and Fuel Company, of De Soto, Mo., have filed incorporation papers, detailing that its object is to manufacture and distribute gas to the citizens of the named place. It is capitalized in $100,000, the incorporators are Albert J. Robus, H. C. Dureing, Joseph Stevens and J. M. Kline and John H. Gibbs (all of St. Louis), and it is in possession of a valuable contract for the public lighting of De Soto. The named persons are all responsible men.

THE trustees of the Troy (N. Y.) Gas Company have perfected the following executive organization: President, E. C. Murphy, 2d; Vice President and General Manager, H. C. Shields; Secretary and Treasurer, W. C. Coleman.

MR. ARTHUR H. BLANCHARD, Mem. Am. Soc. C.E, Consulting Highway Engineer, formerly of Providence, R. I., announces that his offices and laboratory have been removed to Broadway and 117th street, New York city.

MR. C. F. YOUNG, whose recent purchase, at foreclosure sale, of the properties of the Alpena (Mich.) Gas Company, was reported in the JOURNAL, will hereafter operate the business on personal account. Mr. George P. Chambers is to act as local manager. As an earnest of his intention respecting the operation of the Company, the proprietor has underway the placing of 2 miles of 6-inch mains, that will be hooked up before frost enters the ground. Other betterments, especially in respect of the manufacturing plant, will be made early next spring.

MR. S. E. DILLON, since 1909 Chief Clerk and General Manager of the Arkansas, Louisiana and Gulf Railroad, has resigned. He goes to Hot Springs, Ark., there to become General Manager of the gas, electric light and street railway systems, owned by Col. S. W. Fordyce, of St. Louis.

THE Antigo (Wis.) Gas Company has taken over the property of the Antigo Electric Company, and will hereafter operate the same. Joint offices have been temporarily set up in the Rayworth Building; but these will be abandoned when a more suitable location can be secured. The officers elected are: President, R. Koebke; Vice-President, Edward Neff; Secretary, J. C. Wright; Treasurer and Manager, E. S. Rayworth. A resolution to bond the joint enterprise in $25,000 has been agreed to, the proceeds of the issue to go towards putting the plants in good working condition.

MESSRS. A. E. DUNN and O. L. Lewis, representing the Newton (Ia.) Construction Company, recently visited Paxton, Ills., with a view to determining the advisability of constructing a gas plant there.

MR. JOHN FREEMAN, a resident of Louisville, Ky., for 40 years, 30 years of which were spent in the employ of the Louisville Gas Company, died at his home in Louisville some days ago. He was in his 60th year, and is survived by his widow, one daughter and two sons.

MR. DANIEL A. CURTIN, who, on March 10, 1909, was removed from the post of Assistant Engineer, Department of Gas, Water and Electricity by Commissioner Thompson, was reinstated some days ago, after mandamus proceedings that resulted in a jury trial. The verdict also entitles him to recover arrearages of salary on the basis of $4,000 per annum.

THIS "recital" is given for what it is worth, which may not have much value, in that it appeared in a recent issue of the New York *Evening World*: "A musically inclined cat, in the home of Alderman James D. Haggerty, Willimantic, Conn., saved the lives of the entire family. The cat became worried over the smell of escaping gas on the lowest floor of the house and gave the alarm by running up-and-down the keyboard of the piano. Mrs. Haggerty was awakened to find the house filled with gas from a leaky valve in the kitchen range. Two members of the family were already overcome. The cat had been taught to strike the keys of the piano when it was hungry."

THINGS seem to go by contraries in Beatrice, Neb., in so far as the dealings between a Board of Public Council and a gas company are concerned. In any event, last summer the Beatrice Council, having investigated the contention of the Gage County Gas Light and Power Company, that it was losing money through being held to its franchise selling rate of $1.25 per 1,000, and proved the correctness of the contention, it was decreed that it could charge $1.35 cents. That figure, of course, was then put in effect. Early this month a petition, signed by 250 property owners of Beatrice, was presented to Council, the burden of which was that the $1.25 be reinstituted. The Council, however, flatly refused to do so.

THE contract for the new water gas plant in Key West, Fla., has been awarded to the Gas Machinery Company, Cleveland, O. The agreement includes the placing of water gas generating apparatus, boilers, purifiers, station meter, exhausting and tar extracting machinery, and all connections, as well. The housing of this plant will be of special design to accord with the climate of Key West. The plant is to be ready for operation in the Spring of 1912.

THE bond issue ($100,000, at par) emitted by the City Council of Albany, Ga., a necessary portion of which sum is to be devoted to the construction of a gas plant to be operated on public account, was disposed of at public bidding. The purchasers were the citizens First National Bank and the Exchange Bank, at their joint bid of 103.75. A large bond investing concern in New York bid 103.25; another, from Baltimore, Md., was 103. That looks like good credit.

THE Town Council, of Farley, Ia., having been instructed by the voters to construct a municipal gas plant, has determined to erect one on the greased air order. More money thrown away.

THE East Ohio Gas Company, of Cleveland, O., the commercial division of which is under the direction of Mr. F. R. Hutchinson, reports that several hundred of the Welsbach Bungalow type of lamp were placed by it during the last 6 months. It is placed only where artificial gas is being distributed in that city. The figure charged for it is $3 payable in 4 consecutive instalments of 75 cents each. A guarantee against "breakage of any kind" for 6 months is given from the date of placing. The burners in this type of lamp consume 3.60 cubic feet per hour.

THE project to lay a high pressure line between Goshen and Walden, N. Y., to supply the residents of the latter with gas from Mr. J. H. Findlay's plant in former, languishes; and there is little wonder for that somnolent condition of affairs; for, in addition to the stipulation that a selling rate in excess of $1.25 shall not be allowed, it is further exacted that the grantees shall unconditionally pay into the public treasury of Walden the sum of $5,000 before the franchise becomes operative. The greed of the Walden's rulers certainly stands in the way of its development, for certainly the McDonald-Gamble combination are not of the type that responds readily to a pure-and-simple hold-up. To tell the whole truth, if any royalty (or call it what you will) is to be offered it would seem the more reasonable that such royalty should be paid by the rulers rather than by the syndicate. The latter is the one who assumes the commercial risk involved.

HERE is a replica of a letter received some days ago by the Secretary of large New England Gas Company:

"It look offill funny to me that my Bill is 270 and my house clozed up for tu Weeks this man tuck the meder must have forget his Glasses or tuck this Meder on the Dark I will Pay this Bill Butt no Moare Like this my gass Bill was all Right I used the Gass Butt did not used the Electric Light 15 times all this Muth and not 30 menets at time, You trul.

"No Wounder the man did not Clock the Both Bill like he Allways did I am willing to Pay for What I use Butt not for gess Work. B. Ryan."

The Market for Gas Securities.

The Directors of the Nation, "having decided to bring suit for the dissolution of the United States Steel Corporation," on the usual grounds (although we do believe the indictment *ex cathedra* fails to contain the word intimidation) caused a drop of 3½ points in Consolidated, as between yesterday (Thursday) and the opening to-day. This, too, in face of the fact that the usual quarterly dividend (1½ per cent.) was declared. At noon to-day (Friday) it was 135½ to 136. But why should any comment be made on this variation? The Company never was in better shape.

Our Brooklyn Union neighbors did not seem to take the matter as greatly to heart. In these shares the shrinkage was only ½ point. Other shares did not seem to feel "the blow" to any great appearance. In fact our quotations for Washington (D. C.) gas, right where the Solons will sit to consider the gammonings of the purists, records a smart advance of 9 points, or from 439 to 448 in the bid. No doubt, those shares are worth the figures, too.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

115 BROADWAY, NEW YORK CITY.

OCTOBER 30.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share:

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked*
Consolidated Gas Co.	$78,177,000	100	135½	136
Central Union Gas Co.—				
1st 5's, due 1972, J. & J.	3,000,000	1,000	103	105
Equitable Gas Light Co.—				
Con. 5's, due 1932, M. & S.	1,000,000	1,000	115	118
Mutual Gas Co.	3,500,000	100	155	165
New Amsterdam Gas Co.—				
1st Con. 5's, due 1948, J. & J.	11,000,000	1,000	100	101½
New York & Richmond Gas Co. (Staten Island)	1,500,000	100	35	50
1st Mtg. Gold Bds. 5 p. ct.	1,000,000	—	98½	100½
New York and East River—				
1st 5's, due 1944, J. & J.	3,500,000	1,000	103	105
Con. 5's, due 1945, J. & J.	1,500,000	—	95	100
Northern Union—				
1st 5's, due 1927, J. & J.	1,250,000	1,000	94	100
Standard	5,000,000	100	50	70
Preferred	5,000,000	100	70	100
1st Mtg. 5's, due 1930, M. & N.	1,500,000	1,000	103	105
The Brooklyn Union	15,000,000	1,000	133½	134
1st Con. 5's, due 1948, M. & N.	15,000,000	—	106¾	107
Yonkers	299,650	500	130	—
Out-of-Town Companies.				
Bay State	50,000,000	50	⅜	½
" Income Bonds	2,000,000	1,000	—	75
Binghampton Gas Works	450,000	100	—	—
" 1st Mtg. 5's	500,000	1,000	95	100
Boston United Gas Co.—				
1st Series S. F. Trust	7,000,000	1,000	82	85
2d " " "	3,000,000	1,000	47½	50
Buffalo City Gas Co.	5,500,000	100	5	8
Bonds, 5's	5,250,000	1,000	59	60
Capital, Sacramento	500,000	50	—	35
Bonds (6's)	150,000	1,000	—	—
Chicago Gas Co. Guaranteed Gold Bonds	7,660,000	1,000	104	106¼
Cincinnati Gas and Electric Co.	29,500,000	100	92	93
Columbus (O.) Gas Co., 1st Mortgage Bonds	1,500,000	1,000	96	98
Columbus (O.) Gas Lt. & Heating Co.	1,682,750	100	90½	91
Preferred	3,028,500	100	75½	80
Consumers, Toronto	2,000,000	50	200	204
Consolidated, Baltimore	13,460,084	—		—
Mortgages, 5's	3,400,000	—		—
General Mortgage 4½	10,661,0 0	—		—
Con. Gas Co., Baltimore City, 4½	2,751,000	—		—
Consolidated Gas Co. of N. J.	1,000,000	100	15	—
Con. Mtg. 5's	976,000	1,000	92	95
Bonds	75,000	—	—	100
Denver Gas and Electric	3,500,000	—	102	105
Detroit City Gas Co.	6,580,000	—	—	50
" Prior Lien 5's	5,619,000	1,000	97	100½
Detroit Gas Co., 5's	881,000	1,000	75	80
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	—	101
Essex and Hudson Gas Co.	6,500,000	—	39	40
Fort Wayne	2,000,000	—	—	—
" Bonds	2,000,000	—	55	—
Grand Rapids Gas Light Co., 1st Mtg. 5's	1,350,000	1,000	100	101
Hartford	750,000	25	190	200
Hudson County Gas Co., of New Jersey	10,500,000	—	112	113½
" Bonds, 5's	10,500,000	—	108	108½
Indianapolis	2,000,000	—	78	83
" Bonds, 5's	2,650,000	—	104½	105
Jackson Gas Co.	250,000	50	92	—
" 1st Mtg. 5's	290,000	1,000	97	100
Kansas City Gas Light Co., of Missouri	5,000,000	100	—	36
Bonds, 1st 5's	3,822,000	1,000	102	104
Laclede Gas Co., St. Louis.	10,000,000	100	104¼	104½
Preferred	2,500,006	100	114	120
Bonds	10,000,000	1,000	102½	103
Lafayette Gas Co., Ind.	1,000,000	100	—	60
Bonds	1,000,000	1,000	60	65
Louisville	2,570,000	50	143	145
Madison Gas and Electric Co.				
" 1st Mtg. 6's	400,000	1,000	106	108¾
Massachusetts Gas Companies, of Boston	25,000,000	100	91¼	92¾
Preferred	25,000,000	100	96½	97¾
Montreal Gas Co., Canada	2,000,000	100	218	218¾
Nashville Gas Light Co.	1,000,000	100	110	—
Newark, N. J., Con. Gas Co.	6,000,000	—	56	58
Bonds, 6's	5,000,000	—	137	138
New Haven Gas Co.	2,000,000	25	200	—
Peoples Gas Lt. & Coke Co., Chicago	25,000,000	100	107	107¼
1st Mortgage	20,100,000	1,000	—	—
2d "	2,500,000	1,000	104	—
Rochester Gas & Electric Co.	2,150,000	50	88	—
Preferred	2,150,000	50	118	—
Consolidated 5's	2,000,000	—	104¾	105½
San Francisco Gas Co., Cal.	15,500,000	—	—	—
St. Joseph Gas Co.—				
1st Mtg. 5's	1,000,000	1,000	100	102
St. Paul Gas Light Co.	2,500,000	100	—	—
1st Mortgages, 6's	650,000	1,000	104	105
Extension, 6's	600,000	1,000	112¾	115
General Mortgage, 5's	3,447,000	1,000	97	98
Syracuse Gas Co., N. Y.	1,975,000	100	50	55
Bonds	2,047,000	1,000	101	103
Washington (D. C.) Gas Co.	1,600,000	200	439	440
1st Mortgage, 6's	600,000	—	—	—
Western Gas Co., Milwaukee	4,000,000	—	—	—
Wilmington (Del.) Gas Co.	600,000	50	861	—

MEETING TIMES OF THE VARIOUS GAS ASSOCIATIONS.

American Gas Institute.—Annual meeting, October, ——, 1912. Atlantic City, N. J. Officers: President, Ira C. Copley, Aurora, Ills. Secretary, Geo. G. Ramsdell, 29 West 39th st., N. Y. City.

Canadian Gas Association.—Annual meeting, ———— Officers: President, Arthur Hewitt, Toronto, Ont.; Secretary and Treasurer, John Keillor, Hamilton, Ont.

Empire State Gas and Electric Association.—Next meeting, Syracuse, N. Y., Nov. 1911. Officers: President, R. M. Searle, Rochester, N. Y.; Secretary, C. H. B. Chapin, 29 W. 39th street. New York City.

Guild of Gas Managers of New England.—Annual meeting, March, 1912. Young's Hotel, Boston; monthly meeting, second Saturday. Officers: President, Walter G. Africa, Manchester, N. H.; Secretary, H. K. Morrison, Brockton, Mass.

Illinois Gas Association.—Annual meeting, time, March, 1912, Chicago, Ills. Officers: President, C. B. Strohn, Elgin, Ills.; Secretary-Treasurer, F. E. Newberry, Dixon, Ills.

Illuminating Engineering Society.—Annual meeting, Sept. ————1912, ———— Meetings of Sections, monthly. Pres't, A. E. Kennelly, Boston, Mass.; Secretary, Preston S. Miliar, 29 W. 39th street, N. Y. City. Sections: New York, Secretary, Albert J. Marshall, 16 East 40th street. New England, Secretary, H. C. Jones, 10 High street, Boston, Mass. Philadelphia, Secretary, L. B. Eichengreen, Broad and Arch streets. Chicago, Secretary, A. L. Eustice, 105 North Wabash avenue.

Indiana Gas Association.—Annual meeting, Jan. 17 and 18, 1912, Indianapolis. Officers: President, S. E. Mulholland, Fort Wayne; Vice-President, Howard L. Olds, Indianapolis; Secretary-Treasurer, Philmer Eves, Indianapolis.

Iowa District Gas Association.—Annual meeting, time, May, ——, 1912; Clinton, Ia, Officers: President, G. W. Clabaugh, Omaha, Neb.; Secretary and Treasurer, G. I. Vincent, Des Moines, Ia.

Kansas Gas, Water and Electric Light Association.—Annual meeting, time, Sept. 1912. Manhattan, Kas. Officers: President, B. F. Eyer, Manhattan, Kas.; Secretary and Treasurer, J. D. Nicholson, Newton, Kas.

Michigan Gas Association.—Annual meeting, time, Sept. ————1912;———— Officers: President, F. W. Blowers, Kalamazoo, Mich.; Secretary-Treasurer, Glenn R. Chamberlain, Grand Rapids, Mich.

Missouri Electric Light, Gas, Water Works and Street Railway Association.—Annual meeting, April, 1912; St. Louis, Mo. Officers: President, F. E. Murray, Louisiana, Mo.; Secretary and Treasurer, N. J. Cunningham, Springfield, Mo.

National Commercial Gas Association.—Annual meeting, December, 1912. Atlanta, Ga. Officers: President, C. L. Holman, St. Louis, Mo.; Secretary, Louis Stotz, 29 West 39th street, New York City.

Natural Gas Association.—Annual meeting, May, 1912, Kansas City, Mo.; Officers: President, A. B. Macbeth, Independence, Kas. Secretary, T. C. Jones, Delaware, O.

New England Gas Association.—Annual meeting, third Wednesday in February, 1912 Boston. Officers: President, J. A. Coffin, Gloucester, Mass.; Secretary-Treasurer, N. W. Gifford, East Boston, Mass.

New Jersey State Gas Association.—President, William H. Pettes, Newark, N. J.; Secretary-Treasurer, Arthur H. Osborn, Belmar, N. J.

Ohio Gas Association.—Annual meeting, February 6 and 7, 1912, Columbus, O.; President, John M. Garard, Columbus, O.; Secretary-Treasurer, T. C. Jones, Delaware, O.,

Oklahoma Gas, Electric and Railway Association.—President, Noel R. Gascho, Alva Okla.; Secretary, H. V. Bozell, Norman, Okla.

Pacific Coast Gas Association.—Annual meeting, Sept. ————1912, ———— ——Officers: President, W. Baurhyte, Los Angeles, Cal.; Vice-President, Henry E. Adams, Stockton, Cal.; Secretary-Treasurer, John A. Britton, 445 Sutter street, San Francisco, Cal.

Pennsylvania Gas Association.—Annual meeting, April, 1912, Williamsport, Pa. Officers, President, C. W. Butterworth, Millon, Pa; Secretary-Treasurer, William H. Merritt, Lebanon, Pa.

Society of Gas Lighting.—Annual meeting, December, 1911; monthly meeting, second Thursday. Place, New York City. Officers: President, Fred. S. Benson; Secretary, George G. Ramsdell, 254 West 39th street, New York city.

Southern Gas Association.—Annual meeting, April, 1912, Jacksonville, Fla. Officers, President, H. B. Hoyt, Jacksonville, Fla.; Secretary-Treasurer, E. D. Brewer, Atlanta, Ga.

Southwestern Electrical and Gas Association.—Annual meeting. April 27, 28, 29, 1912; Houston, Tex. Officers: President, J. E. Carroll, Beaumont, Tex.; Secretary, D. G. Fisher, Dallas, Tex.

Wisconsin Gas Association.—Annual meeting, May 15 and 16, 1912, Milwaukee, Wis. Officers: President, H. M. Buck, Waukesha, Wis.; Secretary-Treasurer, Henry Harmon, Milwaukee, Wis.